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THE A.V.A. CONVENTION

Detroit is getting ready to act as host for those who attend the eighth annual convention of the American Vocational Association convention, December sixth to ninth.

Judging from former conventions, the coming one will have much to offer to both vocational and industrial-arts teachers. The theme "Vocational Education for Relief and Reconstruction" chosen for the 1933 convention, contains a promise for much fruitful discussion which will help define the path to be taken by this form of practical education during and after the present emergency.

To make the convention a success requires the attendance of every member who can possibly absent himself from his regular duties. The word "convention" connotes "a meeting for a common purpose." The great problem that confronts all of those who are interested in industrial-arts and vocational education is the determination of how to adjust these forms of educational endeavor to the necessity of relief and reconstruction. The 1933 A.V.A. convention, therefore, needs your attendance as well as your views and conclusions as to the solution of the problem that confronts the shop teachers of this country.

THIS MONTH'S COVER

After the logs have been delivered at the sawmill, the process of cutting them into boards begins. The picture shows the interior of a sawmill in the Arapaho National Forest, Colorado. A circular saw is shown cutting its way through a log.

Photo by U. S. Forest Service.

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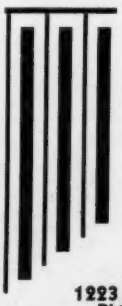

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION
November, 1933
Vol. 22, No. 11

Why Teach Printing?

Frederick James Moffitt

Superintendent Public Schools,
Hamburg, New York

If all superintendents knew why industrial-arts work was part of their curriculums, they would be less likely to look upon it now as a frill or a fad. Mr. Moffitt understands the value of this type of work in his school and he is not afraid to tell taxpayer, tradesman, and politician what it would mean to take it out of the curriculum.

AFTER the past five years of endless discussion concerning the fads and frills of modern public-school education, various sections of the American public seem to have discovered where the educator can pinch his budget and save some pennies. It can be done, they claim, by curtailment in the matter of teaching printing in the schools.

Harassed by Taxpayers' Leagues, "advisory committees" of self-appointed investigators and a host of extra-legal organizations, whose purpose would seem to break down the present system of free public education, the teacher of printing, along with his brothers in industrial arts, is almost ready to cry, *enough!* Slashed budgets have cut his first line of defense; boards of education, worried by the snarl of the minority pack, have grown apathetic. Superintendents of schools have lost the enthusiasm they once had. Abolish the teaching of printing and save the budget! In increasing tempo, we hear the cry from the Taxpayers' Leagues, occasional boards of education, and, *mirabile dictu,* even some members of the printing craft who stand peering in at the busy workings of the industrial-arts program.

A member of the school board says: "How can I defend the action of the board in offering courses in printing when the budget is being searched constantly to save every penny?" A conservative taxpayer says: "Here is a frill and a fad in modern education; what benefit will this teaching do our boys and girls who will never be printers anyhow?" The owner of a small shop says: "Better discontinue the work in printing. We have too many printers now."

In answer to the member of the school board, I tell the story of Richard Budd: A year ago a boy came into the office of the superintendent of schools. His attitude was sullen and antagonistic. He had been reported for misbehavior by every teacher in the school. His classification card showed that his behavior was antisocial; home conditions had broken down and the boy was disliked by pupils and teachers alike. In vain the superintendent tried to reason with him but the interview seemed to show there was no place for him in the classroom, and no one who would vouch for him among the school faculty. "Richard," I said to that boy, "I have now given you your last chance and I am afraid I can do nothing more." But wait! The thought of the good work being done in the school printshop came to mind. A quick decision and Richard was placed in a course which introduced him to the printshop. That was a year ago. This noon as I left the school, a bright-eyed, eager boy came into my office. "Mr. B. (the printing teacher) told me you were visiting some other school printshops today," he said. "Won't you take a sample of our work to show them?" Richard Budd handed me a card printed by himself, hand set, beautifully done, tastily decorated. "I finished a few of these for our guidance program," he told me. I examined the card. It was a neatly printed bit of work which might be used effectively as a message to boys whose interest in school was lukewarm. Ornaments, depicting the various professions, made a very attractive border. The text had been selected by the boy who had labored hard to do an especially worthwhile job. It was a message he had picked up in some magazine and the theme dealt with having a definite purpose in life. This selection had been made by the boy, who of all boys had not, heretofore, shown a spark of "purpose" in his make-up. (See Figure 1.)

Over the main door of the school auditorium hangs a fine new sign. Our annual drive for charity is under way. In large, beautifully designed and clear-cut letters one can read this great message of appeal. "Inasmuch as ye have done it unto the least of these, My brethren. . . ." And in tiny letters in the corner, "Painted by Richard Budd." Painted by a boy who faces life with a definite purpose; a boy who has de-

veloped thoroughness as well as self-respect. Next year that boy will graduate and go to a school where he will be taught the craft of the sign painter. He has the talent that will make him a worthy member of that group of artists. So I say to the member of the school board, "Can't you, now, defend printing education in the public school?"

HAVING A DEFINITE PURPOSE

Printed by Richard Budd

The personnel manager of one of Baltimore's large industrial plants tells the following story: "A boy from a senior high school came to my office and asked me for a job. I asked him what he wanted to do, but he hadn't any idea. I told him to go back to school, get some definite purpose, prepare himself for it, and then come back, and we could give him a job." The personnel manager added impressively, "We cannot place boys unless they know what they want to do. They must have a definite purpose in mind."

Figure 1. Richard Budd's Selection

To the member of the Taxpayers' Association, I tell the story of Joseph Judd. Here is a boy almost twenty years of age, lame and terribly handicapped in the battle of life. He tried various courses in the school and found little to interest him; he tried to get jobs outside of school; he submitted to operations to improve his physical condition; he fought with a cheerful grin. But he just didn't fit, no matter how hard he struggled.

In course of time, as a last desperate resort, Joe was sent to study in the printshop. He was allowed to work around the simple machinery. He set type; he studied papers; he did the thousand odd jobs that make the printer's life a constant whirl of work and fun. Today, Joe will meet you with a straightness of shoulders, a brightness of eyes. He has won his little place in the sun. Severe struggles lie ahead, discouragement and heartburnings, but Joe Judd will meet them with his cheery grin. Life is worth while for a boy who knows he can make good. For Joe has found his little niche in life. That niche is not as a printer, for Joe is only interested in printing insofar as it has taught him self-reliance and a little understanding of the world of machinery. With the basic skills learned in the school printshop, Joe has been able to open doors that have been closed against him. He has heard the call of the moving-picture field. Some day, I suspect, a sound technician will do big things with the movie industry. Mayhap you will notice on some great film the name of a boy who has learned how to work with his hands and brain and will. A community burden has been handled. Your taxes, Mr. Taxpayer, will be lowered instead of raised because of the little printshop in the public school.

And to the printer, who thinks there are now too many printers I say, "Come with me." Together we walk into the school printshop. It is utterly unlike any commercial printshop in existence. Beautiful murals hang on the wall, each, in its own way, depicting the dignity of human labor and the history of the great creative art, the art of printing. The wall panels, made famous by John W. Alexander, are studies showing primitive man in his efforts to find a means of self-expression through the printed word. Linoleum blocks in various stages of cutting are in profusion; samples of printing work from foreign countries are shown as a project in appreciation of fine papers and exotic type. Like many other printshops in the modern school, here is a veritable treasure pile of the gold of past centuries of thought and effort. For in our schools, printing is taught not as a profession — it is taught as an art, rich in the lore of the past. It is taught as a skill, rich in promise for the future. It is taught as an appreciation; a study in the esthetic value of human labor. Here is taught the lesson of the new school: Learning by Doing. Here is taught a project in spelling, in arithmetic, in manual arts, in appreciation of the only lasting values that the human race can hold with confidence.

The teaching of printing today offers so tremendous a challenge for a large place in the educational program, that even those engaged in printing education can scarcely perceive the implications.

The teacher, asked why he teaches printing, will say: "Because the teaching of printing trains the hand and the eye; because it adds to the student's knowledge of good usage of the English language; because it directs clear, forceful oral expression, and because it aids in orderly thinking. Yes, and because it creates and fosters a wholesome respect for books; because it teaches color and perspective; because it helps in forming habits of accuracy and thoroughness and invaluable ideals of neatness and industry."

It is true that printing education does these things but, facing the educational program of tomorrow, there are even stronger arguments for its retention in the public schools of the nation.

The American people are emerging from a period of discouragement and despair. The ideals to which they held have been shattered and disillusionment is on every hand. A complete change in thought and attitude is permeating the depths of social life. In the economic struggle, the good old days of *laissez faire* are gone forever.

For the past decade, prophets have arisen who have foretold the advent of an era of leisure. They have pointed out the problems that such an age would bring. Despite the fact that the warnings were spread far and wide, they were generally received with good-natured skepticism.

Today, the age of leisure has come. By governmental

edict, man may work a limited portion of his time only. The machine age has become a reality despite those who would legislate it away.

The educator has sensed the change. He has seen that it is senseless to teach skills that are out-moded before they can be put to use or to offer smug precepts for a changing civilization.

In order to meet the needs of the boys and girls of today, education must offer, first and foremost, a guiding philosophy. Such a philosophy must train for fundamental honesty of purpose, for useful and intelligent citizenship and for joyful satisfaction in the knowledge that every person has within himself the power to order his own life.

How better can these things be taught than through the teaching of printing, wherein boys and girls are given a basic training in the value and dignity of honest work with hand and brain allied; where they are taught an appreciation of the art which has brought mankind from the caves of savagery to the light of reason; where they learn the satisfactions that come with an ability to think straight and think through the problems that beset them.

It is true that we can slash our budgets, throw our printshops into the discard and offer our boys and girls the curriculum of yesterday. An old story tells us that once upon a time a man tried the experiment of feeding his horse sawdust instead of grain. He wanted to save money. Unfortunately, the ultimate saving was far less than he had planned.

Education in the New Penology

Richard A. McGee

Supervisor of Education,
U. S. Northeastern Penitentiary,
Lewisburg, Pennsylvania

A description of an educational procedure which promises to do much in the reformation of prison inmates.

MORE public attention has been given to the reformulation of theories and practices in the treatment of prisoners during the past decade than ever before. These new half-formed and to some degree untried formulas have grown out of a consciousness that traditional practices are not adequately contributing to the rehabilitation of these men. That the great majority of prisoners cannot or at least do not make satisfactory readjustments to normal social environments is a well-known fact. Penologists, of course, recognize that there are certain types of men for whom the possibilities of rehabilitation are extremely remote. On the other hand, there is little doubt that a more comprehensive and intelligent program might materially reduce the percentage of recidivism. There can be no simple formula of procedure. The coördinated efforts of medicine, psychology, psychiatry, sociology, biology, jurisprudence, education, and good common sense are required.

The best thought of men engaged in penological work dictates that any thoroughly adequate institutional program must incorporate the following major features:

1. A physical plant planned and equipped for a rehabilitation program as well as for the safekeeping and convenient handling of the inmates.
2. A civilian and custodial personnel trained for the work and unhampered by the habits and traditions of outworn practices.
3. A modern hospital staffed with trained and experienced medical and psychiatric practitioners to provide for the correction and prevention of physical and mental disabilities.
4. A social service unit under the direction of professional social workers to assist in making family and occupational adjustments.
5. A consistent schedule of recreational activities designed to maintain health, self-respect, and mental alertness.
6. An industrial program to provide occupation for every inmate. This is particularly important in establishing habits of work and a nominal earning capacity so that released or paroled men may not find the problems of readjustment to civil life too difficult to master.
7. Religious instruction and worship for all who are willing to profit by its beneficial influences.
8. A disciplinary policy which, while not losing sight of the requirements of safety, appeals to fair-minded men and whose ultimate aim is to teach self-discipline.
9. Provision for the general and vocational education of all prisoners who can profit by it.
10. An administrative policy which will provide for the intelligent coördination of all departments with the ultimate objective of studying every facet of each man's case and applying an integrated course of treatment.

In such a general plan the educational unit may become one of the most potent of agencies for reform and rehabilitation.

In the organization of an educational program for any special group, the first consideration should be a study of the special characteristics thereof in order to ascertain the educational needs as a basis for the determination of objectives. To illustrate, we may describe the previous education of some 800 prisoners who have so far been tested in the U. S. Northeastern Penitentiary by saying that the educational range is from illiteracy to postgraduate degrees; 9 per cent of the group are totally illiterate, 20 per cent test below the beginning of the fourth grade, the median educational grade status is the fourth month of the sixth grade. On the other hand, 30 per cent received test grades equivalent to eighth-grade graduation or better, and 20 per cent test above second-year high school. While no test has been given to ascertain college status, it is estimated that about 15 per cent have had some college work and many of these are college graduates.

Twenty-six per cent are foreign-born; slightly less than 8 per cent are colored. It is in these two groups that most of the illiteracy and near illiteracy are found.

The Binet individual mental examination has been given by the medical department to some 500 men. The intelligence quotients range from 38 to 122. Twenty-five per cent have I.Q's below 74.8, which means that one fourth of these men are border-zone and feeble-minded cases. Less than 3 per cent of representative school children fall in this classification. The median I.Q. is 88.5, which indicates that 50 per cent of the men fall in the dull, normal, and feeble-minded groups. Only about 15 per cent of school children may be so classified. Generally speaking, 50 per cent of school children have I.Q's above 100 as compared with 25 per cent of our group. One school child in every five has an I.Q. above 110, while we have less than one in ten in this group.

Age ranges from 17 to 71 years, the median being 33½ years, and the semi-intra-quartile range (middle 50 per cent) from 28 years to 41 years.

The length of sentence ranges from one year and one day to twenty-five years, the median sentence being three years seven months, and the semi-intra-quartile range from two years four and one-half months to six years five months.

From the psychiatric point of view we probably have a higher incidence of emotional instability and psychopathic personalities than is to be found in the general population.

Although the foregoing statistics on the men at Northeastern Penitentiary may be somewhat startling to the layman who has gathered the impression that prisons are filled with clever people, they are even more enlightening when it is told that these men show even higher mental and educational test scores than those of either federal or state prisoners in general.

Prisoners, as a whole, claim vocational experience running the whole gamut of occupational endeavor, but upon closer analysis it is safe to say that about 75 per cent of them have no real trade or profession in which they are fully trained and experienced to the extent that they might be reasonably sure of employment except in times of economic prosperity.

The educational and vocational status of prison populations throughout the country varies greatly among the various institutions depending upon geographical area served, type of institution, and the predominating kind of violations upon which the men are convicted. For example, the percentage of illiteracy is much higher in southern prisons; the proportion of men with more than average education is greater in federal than in state prisons; and the average education is usually higher in reformatories than in penitentiaries serving the same area.

It is quite apparent from the preceding statements that the prison population of this country is a most heterogeneous group, having nothing in common save that every man has been convicted of a violation of a criminal statute. Inasmuch as it is made up of individuals with widely varying social and occupational backgrounds, educational attainment, mental capacity, special interests, and future possibilities, any attempts to devise a mass program is futile. The situation calls for a study of individual needs and a program of individual treatment.

Before entering upon a discussion of the detailed objectives of such a program, it may be advisable to eliminate one or two popular misconceptions. May we emphasize that it is not our aim to provide education for the ostensible purpose of reforming criminals but rather to set up a system of adult education for men who need it, with the hope and belief that it will serve the same good ends as education "outside.". The approach toward ultimate readjustments to society is indirect and accomplished through providing the men with the wish for and the means of legitimate living. The single fact of being sent to prison is a severe social and economic handicap. The further fact of being incarcerated and forced to conform to an abnormal mode of living for a protracted period of time produces additional negative effects. It should, therefore, be the general purpose of the educational program to keep the prisoner's mind alert, to maintain within him a feeling of confidence and self-respect, and to provide him with the general and vocational education which will make it possible for him to reënter normal society and overcome his handicaps without resorting to illegitimate means.

The specific objectives of a program of prison education may be outlined as follows:

1. To raise the general educational level of underprivileged men to the limits of their several abilities. This purpose is subject to the practical limitations of length of sentence, amount of time devoted to education, and the individual interests of the men. The subject matter should be adjusted to adult interests, and practical and utilitarian considerations kept foremost at all times.
2. To provide vocational training:

a) For young men with ability and time enough to learn an occupation.

b) For men who must make readjustments in their occupational knowledge in order to change their vocations. Men who have held fiduciary positions are examples of this type of case.

c) For men who need additional training in occupations already partly learned. One of the most common characteristics of prisoners claiming a smattering of knowledge in several occupations is that they know none of them sufficiently well to hold a position except in times of great labor scarcity.

3. To give an opportunity for general cultural study to men of intelligence and more than average education who need mental stimulation.
4. To provide an outlet for special talents, as in music and graphic art.
5. To establish the means for wholesome mental recreation through library reading and study.

The relatively limited experimentation with education in penal institutions leads us to believe that the objectives outlined above may now be regarded as a sound basis for a working program. However, the details of procedure are far from standardized, and certain matters of policy, such as the use of inmate teach-

ers, or the extent to which education should be made compulsory, are still in controversy.

The practical mechanics of organization for giving instruction must necessarily vary with the requirements of each institution. The buildings, classroom space, disciplinary requirements, amount of maintenance and production work under way, personnel, expense, and policies of the administration are all factors which must be taken into consideration in setting up an educational organization.

At Northeastern we have set up five administrative devices for giving instruction:

1. Day classes which are in session the year round for five days each week. These vary in length from one hour to half a day. Some classes are in session five days a week, others three days, two days, and one day. These classes are attended by men working on irregular shifts and by those who can be spared from their work details during working hours without seriously interfering with necessary work.

2. Evening classes which meet for about 80 minutes daily immediately after the evening meal. These do not interfere in any way with working assignments. Each class is limited to an enrollment of about 15 men to provide for a considerable amount of individual tutoring. We are also attempting to organize our elementary subjects on the unit-contract plan so as to allow each man to advance at his own rate.

3. Extension courses are provided for those men with sufficient education to profit by them. These are studied in the men's cells and dormitories during their leisure time, and are of two types: those prepared in the institution, and outside courses emanating from university extension divisions and private correspondence schools. It has been our experience that those prepared in the institution are by far the more successful. However, it is not economically practicable to write correspondence lessons to match the wide variety of interests.

4. Another type of instruction which is closely related to extension work we have called "contract-conference" work. This involves outlining a course of study to be followed in one or more textbooks and calling the man to the office, periodically, for a short conference at which his previous unit of work is discussed and a new unit assigned.

5. The vocational instruction is correlated with the various shops and maintenance departments of the institution. Certain men, by virtue of their capacities, aptitudes, interests, youth and length of sentence, are designated as vocational trainees. In a typical prison population probably not more than 15 to 20 per cent are prepared to profit by this kind of intensive instruction. These men are placed directly under the supervision of a foreman or department head and also may be attached as understudies to other inmates skilled at the work in question. In addition to obtaining practical experiences in this manner, they are required to spend at least two half days a week in a trade technical class in which they receive instruction in the related and technical subjects pertinent to the occupation they are assigned to learn. An intelligent plan for vocational education should be one of the most important and valuable aspects of a prison program. However, it is extremely difficult to administer with the general organization existing in most institutions today.

The lines along which we must work in prison education are fairly clear and we feel certain that an educational program intelligently conceived and skillfully administered may easily become the most potent force in the establishment of a new and higher plane of prison practice.

Constructional Lettering

H. D. Campbell,

Machine Drafting Division, Vocational Department, J. Sterling Morton High School, Cicero, Illinois

(See Supplement No. 277)

The author of this article has devised a very effective way in which to teach lettering, and the results obtained with it in the various drafting classes at his school have proved its effectiveness.

LETTERING is one of the most important skills to be developed in drafting. Good lettering is required by the formal aims of industrial-arts work since nothing adds more to the appearance of a drawing. Again, the ability to letter well is of prime importance to the graduate of a vocational course, since a sample of his lettering often is the only specimen of work required with an application for a job.

Despite its manifest importance, lettering is sadly neglected in most cases. The teacher knows by experience that few students *like* to letter and he hastens on into more interesting portions of the course lest his class develop a dislike for drafting. Later on, when their lettering is noticeably inferior to the balance of their technique, he attempts to remedy this condition only to find that his class is hopelessly grounded in bad habits of lettering.

It is generally believed that good letterers are born and not made and that, after exposing the class impartially, one should rejoice over the "naturals" and bear with the balance.

There is a certain amount of truth in the first belief, but far less in the second. The fault lies not so much with the alphabet or the students as with our failure to develop adequate methods of solving this problem.

Methods of Teaching Lettering

The most common method is to distribute blue-print examples of good lettering, to demonstrate the various constructions, and to say "Make your letters like that." When the class fails to do so the teacher points out the mistakes made by the individual student. An acceptable standard of excellence is reached only after an infinite number of individual corrections. A small percentage of the class learns to letter well, another small percentage does fairly well eventually, but a majority of the class remain poor letterers to the end.

Another method is to use exercise booklets designed to teach lettering after the manner employed in penman-

ship copy books. Letters are lightly printed in the early portions of the books and the students trace over them. Later on, good examples of lettering are offered for copying. The use of this method will raise the standard of lettering considerably, since an attempt is made to analyze the difficulties, and a systematic routine is followed in overcoming them.

In order to improve on these two methods of teaching lettering, I decided to approach the problem from the student's point of view and developed a series of explanations and demonstrations of correct constructions which could be understood by all. After each letter had been drawn correctly, I planned to have this construction repeated until it became habitual.

Furthermore, I decided to attempt to teach but one alphabet, since the average student cannot learn to letter well in both upper and lower case in the limited time available. Inquiry among professional draftsmen proved that this belief is widely accepted in industry.

It has been customary in school practice to insist upon lettering at an angle of 70 or 75 degrees. I was interested in finding the prevailing industrial practice, since it seemed more reasonable to use the 60-deg. triangle which all students must have. Table II gives the preference of those chief draftsmen who prefer slant lettering as to the angle used:

Table II

A — Use lettering at 60-deg. slant	58%
B — Use lettering at 70-deg. slant	12%
C — Use lettering at 75-deg. slant	24%
D — No standard slant	6%
	100%

With all of the foregoing considerations in mind, the following steps were taken to develop a method of teaching lettering to be based upon thoughtful construction rather than upon thoughtless imitation.

Fig. 1. Copy of alphabet and figures which is to be fastened to the student's T square, as shown in Figure 2

Table I shows the preferences of 172 chief draftsmen as determined in a recent survey of industrial practice.

Table I

A — Use caps only	59%
B — Use caps and lower case	37%
C — No answer	4%
	100%
A — Prefer slant lettering	59%
B — Prefer vertical lettering	40%
C — No answer	1%
	100%

First, it was necessary to redesign the Reinhardt alphabet in order to present a simple construction for each letter and figure, as shown in Figure 1. Second, the sheet of instructions for lettering shown in Supplement No. 277 was prepared. A copy is given to each machine-drafting student for his guidance. Third, a printed copy of the alphabet, numerals, and fractions was given to each student and he was told to shellac it to his T square, so that he would have an example of good lettering constantly before him. (See Fig. 2.)

In the first discussion of lettering the attention of the class is to be directed to the step-by-step construction of each letter as follows:

Construction of Letters

A — The width of *A* equals 2/3 the height. The top of the letter comes in the center of the space. The bar is a horizontal line 1/3 the height above the base. No line coincides with any slant guide line.

B — Width of the bottom 2/3 of the letter equals 2/3 of the height. Width of the upper 1/3 of the letter equals 2/3 of the width of the bottom part. *B* is made with one slant line at the left, three short horizontal lines (like a narrow *E*), and two semi-ellipses.

C — This letter is made on the basis of an ellipse. It begins 1/6 of the height down from the upper right-hand corner and follows the ellipse up and around to a point 1/3 the height above the bottom horizontal guide line in the lower right-hand corner.

D — Similar to *B*.

E — The upper line is ¾ the width of the letter, the center bar is ½ the width long and 1/3 the height down from the top, and the bottom line is as long as the letter is wide.

F — The construction of *F* is obvious.

G — Similar to *C* with the addition of a horizontal line ½ as long as the letter is wide halfway up from the bottom guide line.

H — Obvious.

I — See "Instructions for Lettering."

J — A straight line is drawn from the top down to the middle of the right-hand side where it is tangent to part of an ellipse which extends down, around, and up to a point 1/3 above the bottom guide line in the lower left-hand corner.

K — Draw a line down the left-hand guide line. One diagonal starts at a point ¼ the width of the letter in from the upper right-hand corner of the space and extends down to a point on the left side, 1/3 the height up from the bottom. The other diagonal starts at the lower right-hand corner, is aimed at the upper left-hand corner, and ends where it meets the first diagonal.

L — Obvious.

M — See "Instructions for Lettering."

N — Obvious.

O — An ellipse.

P — This letter is made with a slant line at the left, two short horizontal lines, and a semi-ellipse. The lower horizontal line is ½ the height down from the top.

Q — This letter is made on the basis of an ellipse. It has a tail which starts

at the lower right-hand corner of the space, is aimed at a point 2/3 the height up from the bottom of the left-hand side, and ends where it meets the horizontal guide line 1/3 the height up from the bottom.

R — This letter is made the same as the letter *P* with the addition of a diagonal line starting from the lower right-hand corner of the space and aimed at the upper left-hand corner.

S — Made within an ellipse. It starts 1/6 of the height down from the top in the upper right-hand corner and follows up and around the ellipse to a point approximately opposite on the left-hand side. At this point it curves in and crosses the horizontal guide line 1/3 of the height down from the top until it joins the ellipse again 1/3 of the height up from the bottom. From this point it follows the ellipse down, around, and up to the point 1/3 the height above the base in the lower left-hand corner.

T — Obvious.

U — Two straight lines halfway down meeting the lower half of an ellipse.

V — Similar to an inverted *A* without the bar. No line in *V* coincides with either slant guide line.

W — Width of this letter equal to the height. Draw a slant line in the middle of the width. Draw a narrow *V* in each half. No line in *W* coincides with either slant guide line.

X — Obvious.

Y — Similar to the upper half of *X* plus a slant line in the middle of the space.

Z — Obvious.

The reader is left to his own devices as regards the numerals. They may be constructed quite as definitely as the letters.

Industrial-arts students in their first semester of

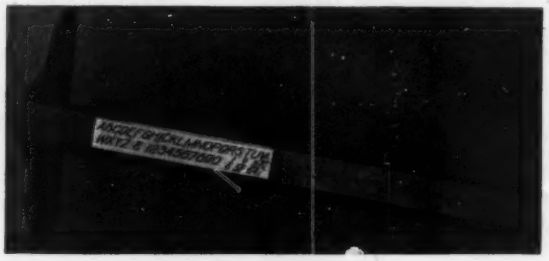


Fig. 2

drafting are required to do their lettering exactly as illustrated. Those who elect vocational machine drafting are required to continue with this style of lettering until they have reached an acceptable standard, if they have not done so before. After that, they are allowed to develop individual styles, provided only that their letters remain plain and readable. In a semester or two the uniformity is lost, to some extent, but a more graceful style is gained. The resulting lettering is more pleasing to the eye than the somewhat stiff style necessitated by a definite construction for each letter.

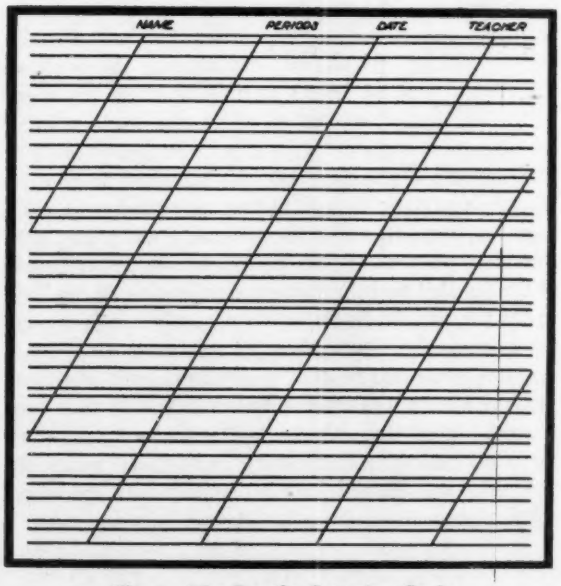


Fig. 3. The Practice-Lettering Card

Lettering Practice

Instruction in lettering begins with the first day of each semester. The construction of letters, figures, and fractions is explained and demonstrated. Each student is provided with a lettering strip which he reproduces at a large scale until he knows how to make each letter, etc. After the construction has been learned, the class is provided with lettering cards. (See Fig. 3.) These cards are five-inch squares, of detail paper, upon which are printed, in pale green or orange ink, horizontal guide lines and a few slant guide lines. The latter assist the student in keeping the slant after he has been excused from the chore of inclosing each letter in slant guide lines. Industrial-arts students are required to letter one card a week throughout the semester unless they demonstrate a proficiency which excuses them.

A typical routine in using these cards follows:

LETTERING EXERCISES

	Card Number	Type of Letters	Remarks
First Month	1 2 3 4	Straight-line letters. Elliptical letters. Letters combining straight and elliptical elements. Figures, whole numbers, and fractions.	All slant guide lines made with T square and triangle.
Second Month	5 6 7 8	Awkward combinations of letters. Paragraph from a handbook. Paragraph containing words, numbers, fractions.	All slant guide lines made with T square and triangle. Alternate lines made without ruled slant guide lines.
Third Month	9 10 11 12	As in cards 7 and 8, except that only the first line in each card has slant guide lines.	
Fourth Month	13 14 15 16	As in 7 and 8, except that slant guide lines are omitted entirely. As above except that letters are 2/3 the height of the lined spaces; that is, 1/8 in. high rather than 3/16 in. high.	
Fifth Month	17 18 19 20	Pencil tracings on vellum or bond paper or two pencil lettered cards. Ink tracings on vellum or bond paper of two pencil lettered cards.	

Summary

The theory upon which this system of teaching lettering is based may be summarized in one sentence. *Most students must be taught to visualize not only the finished letter but also the steps in its construction.*

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

The Safety Question

The twenty-second annual Safety Congress and Exposition was held at Chicago, October 2–6. In spite of the fact that the American Legion convention and the Century of Progress exposition vied with each other in tempting all who came to Chicago to partake of their respective offerings, large groups of serious-minded safety engineers, counselors, industrial relations and personnel managers, and other business and industrial executives, spent five strenuous days discussing and learning as much about the subject of safety as possible. The earnestness with which they attacked the problems presented by the various speakers and discussion leaders was inspiring to say the least.

Their attitude clearly gave the reason why the safety movement has gained such headway in industry. In the discussions, these men showed surprisingly little pride in what they had accomplished. Most of them seemed to be obsessed with the idea that there was so much that they had not done that the things that had been accomplished were worth very little.

There were also sessions in which school safety was discussed. The attendance at these sessions, especially the one on school-shop safety, was very small. This no doubt is due to the fact that only the local teachers can avail themselves of the opportunity to attend, and under present conditions in Chicago one could hardly expect any attendance. With a school board, better versed in politics than in educational theories, the crippling of the Chicago school shops has been so complete that there were but few teachers who could have attended the Safety Council's deliberations. But in spite of the absence of an audience, the papers will be made available to the teaching fraternity the country over, and it is hoped that they will assist in making the teaching of safety in the school shop more vital and efficient.

Most shop teachers take the matter of safety instruction very seriously, nevertheless, there is room for a great deal of improvement. Wayne M. Judy's article, published in the September issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, shows that at least twelve per cent of accidents happening in the shops of the state in which he conducted his study, could have been avoided if the teaching of safety, and the safeguarding of the school-shop activities, had been done with more care. These findings therefore ought to make every shop teacher think seriously about his part in the safety program. The question as to the legal liability for an accident is serious enough, but the moral responsibility alone should prompt every shop teacher to do his utmost in the promulgation of safety instruction.

Besides giving the instruction, the shop teacher must check on how much or how well the student has learned, by frequent and comprehensive tests. These tests, duly signed by the student and carefully filed, may become valuable evidence when some student, who has been injured, claims never to have received safety instructions covering the use of the tool or the machine with or at which he was hurt.

Much help for the teacher who wants to make his safety teaching vital, may be obtained cheaply or even gratis in the form of posters, illustrations, and printed matter from the National Safety Council, from manufacturers of guards, goggles, and other safety appliances, as well as from this and other magazines specially published for the teacher of the school shop.

Besides the teaching of safety, the shop organization must be such that careless boys, those who are apt to be disobedient, hasty, inattentive, and those willing to take a chance are continually under the watchful eye of someone.

In the large classes which are becoming more and more common, it is impossible for the teacher to watch and see everything. He must therefore train some of his students to act as safety engineers. Their training in safety supervision will stand them in good stead when they enter industry, and will, at the same time, turn the shop into a laboratory in which safety is not only discussed but also practiced.

If there is one outstanding duty to be undertaken by the school shop at the present time, it is to prepare safe workers. It is of little value to teach the student to use tools and machines, if he is not, at the same time, taught how to use them safely.

Helping to Sell Industrial-Arts Work

Visitors at exhibits of students' shopwork are apt to be exceedingly critical about the way in which the shop projects are constructed and finished. Usually their criticism fails to take into account the youth of the student and the length of time which he has spent in the particular subject of which the project under consideration happens to be a part. Probably some of this adverse criticism might be obviated if the explanatory notes attached to the projects were a little more explicit. To make them definite and clear, they should contain more than merely the name and grade of the pupil. This information usually means very little to the layman. If, however, the tag attached to a project informs the visitor that Johnnie Doe, 11 years of age, has made and finished a certain project after having had a certain number of hours in this or that shop, it might give the onlooker an opportunity to more truly estimate the exceedingly great value which the youngster has derived from his contact with the school shop.

Most laymen fail to take into consideration the exceedingly limited amount of time which junior- and senior-high-school students spend in the shop. The employer of labor who not infrequently sharply criticizes the school would probably get quite a different slant on this question if he were asked how much of the trade his apprentices know after they have spent 19 eight-hour days in his shop. Most laymen do not know or do not think about the fact that a year of work in a school shop really means that the industrial-arts boy has put in at most 19 eight-hour days on the subject, and that he has not been studying the subject from the vocational angle at that.

Besides this information on the individual projects, there ought to be a clear statement of the objectives of the work displayed, written in such a way that he who runs may read. It seems almost impossible to get the thought across to the public, that industrial-arts work in the junior high school is nonvocational. There are still too many men in both business and industry, yes and even in education, who think that the boy who has taken woodwork, sheet-metal work, machine-shop practice, auto mechanics, or printing for one or two semesters in the junior high school should be equal, at the very least, to a full-fledged journeyman.

The Pioneering Spirit

In a large city, the name of which is charitably withheld, shopwork had been abolished, although mechanical drawing was retained. In the name of a much-maligned economy, the size of classes was increased, although the room in which the pupils were to be accommodated was left just as it had been.

The school year, in that city, also for the sake of economy, had been shortened several weeks. When finally the classes met, it was found that the existing accommodations were but poorly adapted to the service which they were to render. To add to the difficulty of the drawing teacher's job, no materials were on hand and there was little chance of getting any for more than a week. What to do under such conditions was a riddle the answer of which was puzzling to say the least.

Some teachers met it in a strictly human way. They felt that there was no solution for the problem which confronted them. They were satisfied to bewail their lot, and spent their time giving lengthy chalk talks at the blackboard and grappling with the disciplinary troubles which arose plentifully because of the inactivity of the closely packed students. These teachers, one can readily suspect, were not a sweet-tempered lot at the end of the school day. Probably they should not be blamed for taking what seemed to be the easiest way to solve a vexing problem that conditions had forced upon them. They could not see any solution, hence, as far as they were concerned, there was no solution.

There were others who made their students see the necessity of providing materials with which they could work during the drafting period. This met with some success, especially with those teachers who overlooking their own personal troubles, concentrated on developing a new viewpoint in the minds of students who had been accustomed to receiving gratis whatever materials they needed in their schoolwork. Naturally, with the majority of students coming from homes also affected by economic stringency, this reversal of long-accepted practices was not an easy task. There were always pupils who forgot to bring needed materials but insistence on living up to President Roosevelt's slogan, "We do our part," soon caused an ever-increasing number to coöperate. Some instructors also found these troublesome times almost helpful because it was present conditions which practically forced them to revise their class organizations to conform more nearly with the newer ideas on how large classes may be handled without ignoring individual differences.

These instructors did not let adverse circumstances overcome them. They had the pioneering spirit. They felt that some way, somehow, their problems could be solved. They were courageously looking for a solution. They were not pleased with the conditions with which they were confronted, but they did not succumb to them. They felt that the solving of their problems was a part of their job. By their earnest endeavors they kept their minds occupied and refused to dwell upon the unpromising prospects of the probability of not receiving a needed, though much-abbreviated, pay check at the end of the month.

Some of these braver spirits went even a step farther. Rather than be handicapped because of the absence of needed materials, they bought some to be used by their classes. Some of their fellow teachers, no doubt, chided them for being fools to spend money on things that the school board should really furnish. Nevertheless, these courageous men showed not only the resourceful spirit of the pioneer but also the readiness to make sacrifices which the true pioneer must be willing to do if he is to be a real success.

This small group of men who are so valiantly attempting to make their work successful in spite of imposed conditions deserve to be complimented. They are a credit to their profession and they represent the fine type of altruistic men that may be found so generously interspersed through that large group of shop teachers upon whom devolves the serious task of carrying on in these troublesome times.

The Consumer Objective

The purpose of all practical-arts instruction should be to give an appreciative understanding of tools, materials, processes, and design as found in the work of the world. All of the instruction should be given from the consumer's point of view. The work should be used as a vehicle to carry a rich educational content. — *F. T. Struck.*

Wood Carving—I

J. I. Sowers
Miami, Florida

This is an introductory article of a series of articles on wood carving as adapted to school use. The author shows how readily it may be embodied in the ordinary woodworking course.

MANY woodworking teachers have a feeling that wood carving is too difficult for the school shop. Our experience at Miami shows, however, that the difficulties of wood carving for young students, either have been greatly exaggerated, or that the nature and character of the work has been misunderstood. We introduced it into our woodshop courses four years ago.

It was, of course, necessary that we first educate our teachers, for they, too, had the usual fear that it was too difficult for the student. It is customary at Miami to conduct a teacher's training course each year in the manipulative skills. The shop teachers meet for two hours each Monday evening during part of the second semester. During this time wood carving was taken up by the teachers and this was carried on for the past four years. All of them profited greatly by the instruction, and both they and their students thus added a fine new interest to their own work.

The time devoted to wood carving in our courses does not prevent the teacher from accomplishing the work required in the usual woodworking course. The carving is carried along throughout the course. A little bit of simple carving is added to certain projects in the grades. These become more difficult as the student advances into the higher grades, and, incidentally, he thus learns quite a bit about wood carving without having taken up that subject as a course by itself.

Wood carving is primarily an *art* subject. We may think of it as a decorative art applied to wood: (*a*) by the cutting of a design into the wood; (*b*) by cutting out a background to place a design in relief; (*c*) by modeling a design in wood, after it is brought into relief by cutting away the surrounding material.

Incising

In this article on the subject of wood carving, the work to be undertaken is easily within the reach of the ability of the beginning junior-high-school student. It is known as *incising*, and may be used both with or without a cut-in background. For the first attempts

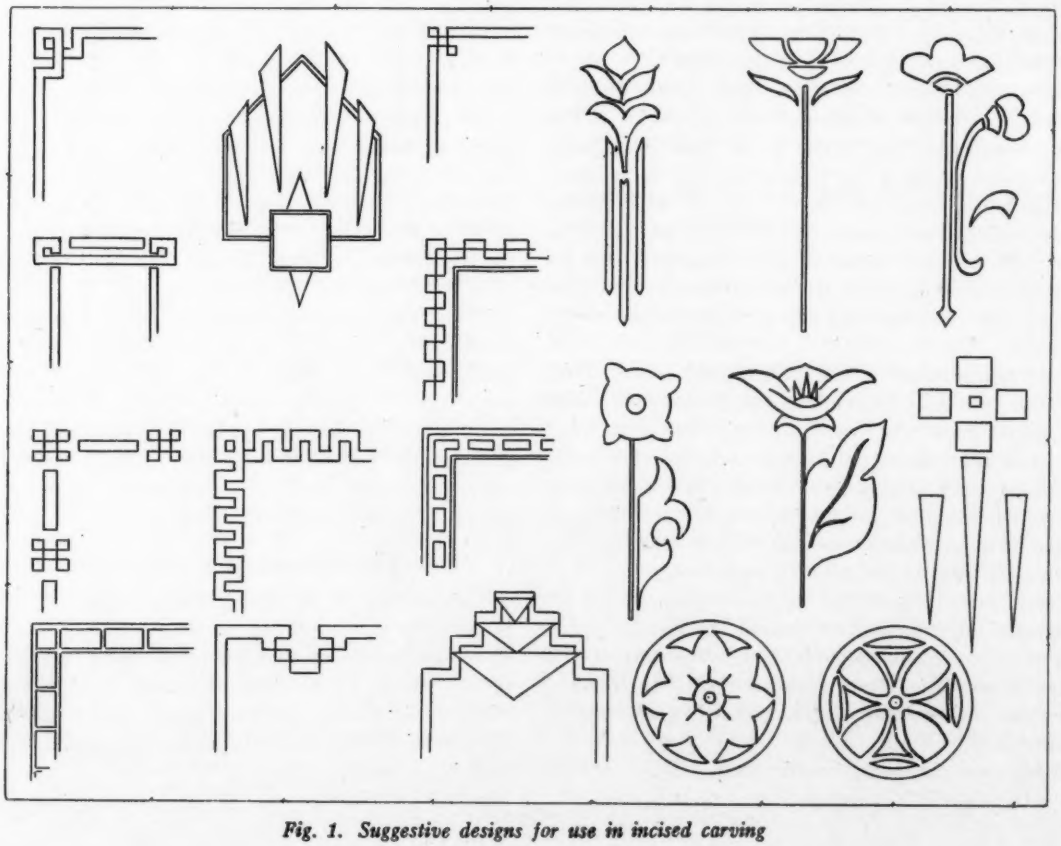


Fig. 1. Suggestive designs for use in incised carving

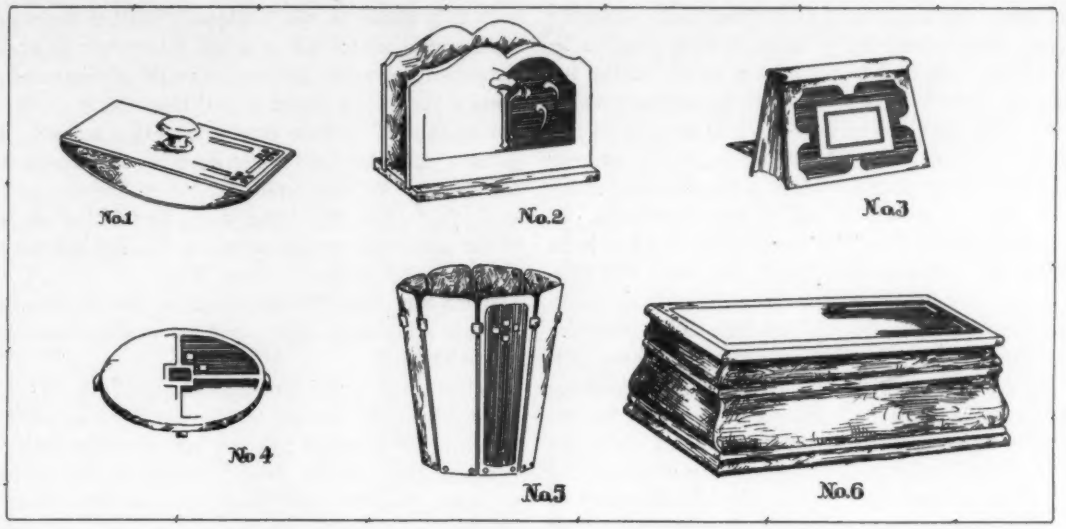


Fig. 2. Incising applied to simple projects in beginning woodwork

the student is asked to merely incise the design, leaving the background as it is. Figure 1 illustrates a number of designs that may be used for this work. These designs are, of course, only suggestive. They may be modified in size and shape to conform to the space they are to occupy. It will be noted that they are all line designs.

After the student has learned how to do incising properly, the next step is to thread in a background of fine parallel lines, placed closely together, with a V tool. Figure 2 shows how designs of this kind may be applied to the projects usually introduced early in woodworking courses. No. 1 in Figure 2 shows a blotter pad with a simple incised design. No. 2 shows a letter holder with incised design and background threaded in with a V tool. No. 3 is a book end treated in the same way. Nos. 4 and 5 show this form of decoration applied to a coffee stand and wastebasket, respectively. No. 6 is called "Captain Kidd's Treasure Chest." In making this box, the student first works out a molding by the use of gouges. This molding must be sufficiently long to make both sides and ends. The top is then carved as shown. For advanced students, a relief carving of Kidd's ship in full sail with an island and some palm trees in the background may be substituted for the simple design shown.

Figure 3 shows all the tools needed for incising. They are inexpensive, and may be purchased anywhere. One knife is really sufficient, and the hook-blade knife will be the most satisfactory.

Figure 4 shows how to hold the V tool when threading-in the background. We invented the term *threading-in* the background, because it seemed to carry over into the minds of the young students that they are to cut a very fine series of parallel lines with the grain of the wood. These are to be cut as close together as possible, and only just enough wood is to be removed to have the lines clearly visible.

Woods. The character of the woods used in this early form of carving should be such as have a close, firm, straight grain. Basswood is perhaps the best cheap wood for this purpose. Here in the south we use magnolia since it is plentiful and inexpensive. Other woods that will suggest themselves for this use are cottonwood, spruce, white fir, or box elder for better-grade projects where this wood can be procured cheaply enough.

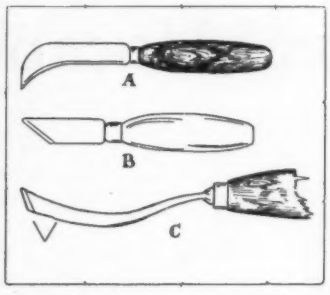


Fig. 3. Tools required for incised carving work:
A — Hook-bill knife
B — Bevel-point knife
C — V-tool

Method. The design is penciled or traced on the work, using carbon paper. For most of this work the design may be drawn directly on the surface to be decorated, using the rule and try-square. The next step is to do the *incising*. The hook-bill knife shown at A in Figure 3 is the most suitable for this use. If the knife shown at B is already part of the common shop equipment, it may be used in place of the hook-

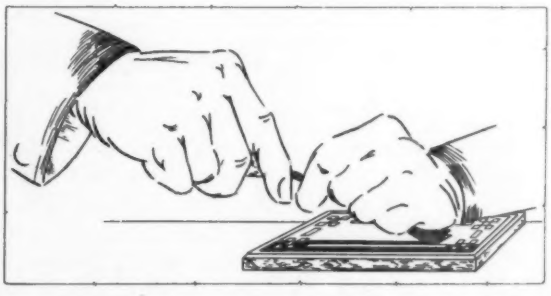


Fig. 4. "Threading-in" the background with the V-tool

bill to avoid buying an extra knife. The hook-bill knife, however, seems naturally to draw straight, and so to cut a clean, straight line with little effort. In the incising, the blade is first to be held upright in making the cut along the line to be removed; then a second cut is made at an angle to the first in such a manner as to take out the pencil mark in a fine, hairlike shaving, or sliver of wood. In this manner the entire design is carved out. After the work of carving has been finished, the next step is to apply the stain. For this, water stain must be used, as an oil-base stain would creep over the small V-cut of the design and get into the background, giving the design a ragged appearance. The design also may be stained a color contrasting with the background, or a two-tone effect may be obtained by using a slightly lighter stain of the same color for the background. This latter is likely to be more pleasing and less garish. Yet in this day of modernistic design, and much use of color, contrasting colors may not be thought objectionable. In a project such as is shown in No. 2, Figure 2, with a threaded-in background, either oil or water stain may be applied right over the whole surface. Since the background presents a very open grain, it will take the stain several shades darker in tone than the design surface. This gives a splendid two-tone effect on any wood commonly used for this type of carving. The design may be further lightened, if necessary, by rubbing out some of the stain with waste, or it may be high-lighted here and there by using fine steel wool.

After the stain has been applied, the piece is ready for any additional finish, such as waxing, varnishing, or shellacking.

While this form of carving is easy and simple enough to be within the ability of a seventh- or eighth-grade student, yet it also gives the boy a manipulative experience that will be most valuable to him when he attempts higher and more complicated forms of carving.

(To be continued)

Technical Vocabularies

John T. Shuman

Williamsport High School,
Williamsport, Pennsylvania

This is the second vocabulary list and is confined to terms used in the machine shop.

Terms Used in the Machine Shop

abrasives
acme thread
addendum
adjustable parallels
adjustment
allowance
alloys
alloy steel
aloxite
aluminum
alundum
angle iron
angular cutter
annealing
antimony
anvil
arbor
arc
autogenous welding
automatic
Babbitt metal
back gear
back lash
ball bearing
barium
bastard
bearing
belt drive
belt lacing
bench vise
Bessemer steel
bevel protractor
bismuth
blacksmith
blister steel
blowhole
blue print
boiler plate
boring
boring bar
boring machine
boring mill
brake
brass
brazing
brine tank
Brinell test
broach
bronze
buffing
bulldozer
burnisher
bushing
butt joint
butt weld
cadmium
calibrate
calipers
  hermaphrodite
  inside
  outside
cam
camshaft
carboloy
carbonizing
carbon steel
carborundum
caseharden
cast iron
cast steel
center drill
center gauge
centrifugal force
chain drive
chamfer
change gear
channel iron
chaser
chattering
check nut
chilled iron
chord
chrome-nickel steel
chrome-vanadium steel
chromium steel
chuck
clamp
clearance
clutch
cobalt
coefficient
cold-drawn
cold-rolled
cold shuts
collar
collet
column
combination bevel
combination chuck
compound indexing
compound lathe gearing
compressed air
concave cutter
concrete
cone center
cone clutch
cone pulley
connecting rod
convex cutter
coolant
copper
core
corundum
cotter pin
counterbore
countershaft
countersink
coupling
crane
crank pin
critical temperature
crosscut file
crowbar
crowned pulley
crucible steel
cut-off tool
cutting lubricant
cutting speed
cyanide
cylinder
dedendum
deflection
depth gauge
dial indicator
diameter
diametral pitch
diamond-pointed
die block
die casting
die holder
differential
divider
dividing head
dog
dovetail cutter
dowel
draft
drift pin
drill bit
drill gauge
drill rod
drills
  center
  countersink
  jobbers'
  letter-sized
  shell
  straight shank
  taper shank
  taper square shank
  three-fluted
drop forging
drop hammer
duplex
durana metal
dutchman
dynamo
eccentric
ejector
electric welding
ellipse
emery
end mill
engine lathe
etching fluid
expanding mandrel
expansion reamer
faceplate
facing tool
feather key
feed gear
fiber
fillet
fillister head
fin
flange
flat bar
flexible coupling
floating tool
flute
fluting cutter
flux
fly cutter
flywheel
force fit
forging
forming cutter
foundation
foundry
friction
galvanized iron
gauges
  Hoke
  Johansson
  plug
  precision
  ring
  screw
  snap
  taper
  wire
gears
  angular
  annular
  bevel
  crown
  differential
  elliptical
  helical
  herringbone
  hobbing
  intermittent
  internal
  involute
  module
  pin
  planetary
  quill
  spiral bevel
  sprocket
  spur
  staggered-tooth
  stub-tooth
  worm
Geneva motion
gib
girder

gland
grinding machine
grinding wheel
grooving cutter
gun metal
hack saw
half-ovals
half-rounds
hammer
  cross-peen
  engineers'
  straight-peen
  riveting
handwheel
hardening
hardie
hardness test
hard solder
headstock
heat treatment
height gauge
helical
helium
helix angle
hexagon nut
high-speed balancing
high-speed steel
hob
hobbing
hoist
hollow mill
I beam
idler
inclined plane
index head
indexing
indexing table
index plate
indicator
inserted cutter
interchangeable
internal grinding
involute
jig
joint
journal
kerf
key seat
key-seat cutter
keyway
knurling
knurling tool
lap joint
lap weld
lard oil
lathe
  engine
  extension
  fox
  gap
  gun
  ingot
  precision
  projectile
  pulley
  roll-turning
  screw-cutting
  speed
  spinning
  turret
  vertical
  watchmaker's
lead
lead screw
leather belt
lever
limit gauge
linear
liner
line shaft
link belt
lubricant
lug
machining
machinist
malleable
mandrel
manganese
mechanic
metallic packing
metal pattern
micrometer
"miked"
milling
milling cutter
mineral oil
miter
molding
monel metal
nickel steel
Nordberg key
octagon
odontograph
oil groove
oil hardened
oilstone
open-hearth steel
ore
oval
oxyacetylene
oxygen
paneling
parabola
parallels
pattern
pawl
pearlite carbon
pedestal
peening
phosphor bronze
pickling solution
pig iron
pinion
pipe thread
piston
pitch
plain milling machine
planer
  open side
  radius
  rotary
  traveling head
planetary gear
platen
plumb bob
pneumatic tools
polishing wheel
potassium
power transmission
preheating
press fit
profiling machine
protractor
pulleys
punch
pyrometer
quadrant
quenching
quill
radial
radii
radius
rake
ratchet
ratchet stop
rawhide gear
reamer
re-center
recessing tool
reciprocating
relief
revolution counter
rheostat
riffler
rivet set
roller bearing
roller chain
root diameter
rope transmission
rotary table
roughing tool
rounds
rules
  caliper
  flexible
  hook
  key seat
  shrink
running balance
running fit
saddle
sand-blast
sand hole
scarf weld
scleroscope
scraper
screw driver
screw machine
screw plate
screw thread
scriber
scribing
sector
segment
sensitive drill
setscrew
shaft hanger
shafting
shaper
shank
sheave
shifting lever
shim
shrinkage
silicon
silver solder
sine bar
sling chain
slitting saw
sodium
solder
solution
spandrel
speed indicator
spelter
spherical
spindle
spiral
spirit level
spline
spot welding
spring
  coil
  compression
  helical
  leaf
  spiral
  tension
  torsion valve
sprocket
square
stainless
straightedge
stud
stuffing box
surface gauge
surface speed
swaging
sweating
swivel vise
tackle
tailstock
tap
tapered
taper gauge
taper pin
taper reamer
tapers
  American
  Brown & Sharpe
  Jarno
  Morse
taper turning
tap holder
T bar
T bolt
temper
template
tension
thermit
thermometer
thickness gauge
thread gauge
thrust bearing
thumbscrew
time study
tin
titanium
Tobin bronze
toggle
tolerance
tool steel
tote boxes
tracing
trammels
trimming die
try-square
T slot
T square
tubing
tungsten
turbine
turret
twist drill
universal
universal milling machine
upsetting machine
vanadium
V block
vernier
vernier gauge
vertical
vertical milling machine
vise
V thread
waterproofing
wear
wedge
welding
welding rod
welding torch
Whitney keys
Whitworth thread
wiggler
wire gauge
Woodruff key
wrenches
  adjustable
  box
  chuck
  construction
  double-end
  general utility
  hook spanner
  monkey
  pin-face
  pin spanner
  pipe
  single-end
  socket
  spanner
  Stillson pipe
wrought iron
Z bars
zinc

The Calendar as a Printshop Project

William T. Murray

Wm. B. Rogers School,
Hyde Park, Massachusetts

A printing job that is instructive and interesting to the junior-high-school student.

IN THE printshop, as in any of his classrooms, the interest of the pupil should be kept at its highest level. Projects that can be taken home, displayed before the family and put to a practical use, will usually accomplish this.

As a project for first-year printers, the calendar is especially to be recommended. It is of practical use, can be made decorative, and has value as a correlation problem. It also serves as a tool for teaching the printer's system of measurement.

It is well to work this job out on the blackboard. Begin by giving the class a lesson on the point system. In our school we use 10-point Century Oldstyle type. A sketch of the calendar is put on the board. Figure 1 shows that the first two lines vary only in the name of the month, so the only problems that arise are those which are concerned with the figures and the spaces between the figures. With Century Oldstyle type, the

figures are found to be just the same size as an en quad. A micrometer is borrowed from the machine shop and a number of en quads and figures are measured. The stick is set to 10 picas (120 points). In the line of single digits the seven figures take up 35 points of the 120 because each figure is equal to 5 points, the same as an en quad. These 35 points are subtracted from the 120, leaving 85 points. The attention of the class is next called to the 3 being directly over the center of the 10 and the 9 over the 16. Then the amount of space to be placed before the 3 and after the 9 is determined, as shown in Figures 2 and 3.

1934 JUNE 1934

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Between single figures, use an Em quad and a 3 em space. Between double figures, use an En quad and a 3 em space.

Fig. 1

Fig. 2

Fig. 3

The 4-em space before the 3 and after the 9 equals 5 points ($2\frac{1}{2} + 2\frac{1}{2}$). Subtracting again, 85 minus 5 equals 80 points. These 80 points will be used for the 6 spaces between each day; $80 \div 6 = 13\ 1/3$ points apiece. The em quad is 10 points thick and the 3-em space, 3 1/3 points. This is then found to be the space used between single digits.

The next step is to find the amount of space between the double figures, each of which is the same size as an en quad or 5 points thick, the two together equaling 10 points. Seven of these double figures equal 70 points, which subtracted from the 120, will leave 50 points. As the row of double figures go to both ends of the stick, the 50 points will be used for the 6 spaces between the days ($50 \div 6 = 8\ 1/3$). The en quad, 5 points thick, and the 3-em space, 3 1/3 points thick, is then found to be the number of spaces between the double digits.

Some of the months will have the 9 and 10 in the line which makes a space between a single and a double digit. A sketch is put on the blackboard with the 9 above the 16, and 10 above 17. The space between 16 and 17 is known, so one side of the 9 is built up to make it as wide as the 10. (See Fig. 3.)

Each pupil is given a different month to set, if it is a small class; or each boy is allowed to set the month in which his birthday occurs, if it is a large class. In a large class the job can be made more interesting by printing the birthday in a different color, with the aid of a frisket.

There are many ways to elaborate the calendars with borders, linoleum cuts, or poems, as shown in Figure 4. If there is a sheet-metal class in the school, small desk stands, similar to the one shown in Figure 5, may be made for the calendar, thus making the project increasingly interesting.

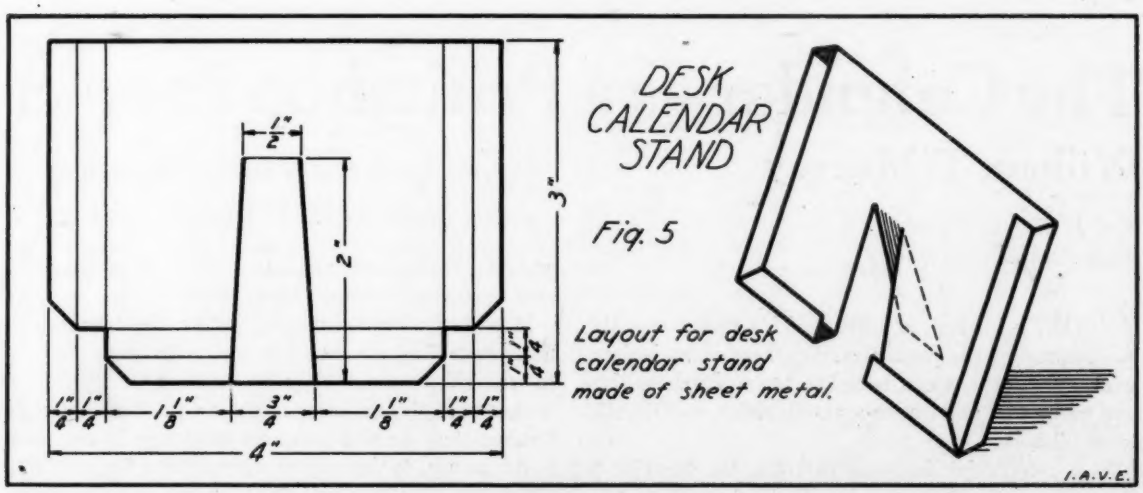


Fig. 5. Sheet-metal desk stand

1934			MARCH			1934
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

TREES

I think that I shall never see
A poem lovely as a tree.
A tree whose hungry mouth is prest
Against the earth's sweet flowing breast.
A tree that looks at God all day,
And lifts her leafy arms to pray;
A tree that may in summer wear
A nest of robins in her hair;
Upon whose bosom snow has lain;
Who intimately lives with rain.
Poems are made by fools like me,
But only God can make a tree.

—Joyce Kilmer

1934			DECEMBER			1934
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

Fig. 4. Some adaptations of the calendar.

Problems and Projects

CONSTRUCTION DATA FOR 1 1/2 KVA SINGLE-PHASE, AIR-COOLED TRANSFORMER

L. E. Sweitzer, Pittsfield, Massachusetts

The transformer described herewith may be termed a general-purpose type which permits the making of various single-phase and Scott-phase connections. It may be rated as an air-cooled transformer; 60 cycles; 1½ kva; primary volts 220; secondary volts, 55/110, with taps for Scott connection; three-phase two-phase.

This transformer has been designed with the idea of ease of construction uppermost in mind.

Single-phase connections permit three-wire operations.

A transformer of 220 volts primary to 110 volts secondary is obtainable when the two low-voltage windings are connected in series; a transformation of 220 volts to 55 volts is obtainable when the low-voltage windings are connected in multiple.

Single-phase connections permit three-wire operation at one-half rated capacity of the transformer (that is, full capacity for one half of the winding) on either the high- or the low-voltage sides, or both, as the case may be. In other words, there is available a reduced kva transformation from 220 volts primary to 55 volts secondary; from 110 volts primary to 55 volts secondary; and from 110 volts primary to 110 volts secondary.

For educational purposes, it is frequently desired to obtain Scott 3-phase 2-phase transformation. With that end in view, proper taps in both the high-voltage and low-voltage windings have been provided so that the transformer may be used either as a main unit or as a teaser unit. Two such transformers would constitute a Scott bank which would provide a transformation of 220 volts 3-phase to 110 volts 2-phase or 220 volts 3-phase to 55 volts 2-phase, 110 volts 3-phase to 220 volts 2-phase, and also (at one-half capacity) 110 volts 3-phase to 110 volts 2-phase. (See Fig. 12.) It should be borne in mind that the bank capacity of two 1½ kva Scott-connected transformers is 3 kva.

Core

A transformer design customarily is built about the core because the windings are more readily designed to accommodate the core than the core to accommodate the windings. The core chosen for this project is of a three-legged type made of rectangular punchings dimensioned and assembled to provide for the windings being placed over the single cruci-

form middle leg, the two outside legs completing the magnetic circuits and providing mechanical support.

Using 14-mil thick silicon steel, five different sizes of punchings are required. The dimensions, weights, and approximate number of sheets are given in the following table:

Core Punching Data

Punching Size No.	*Length in In.*	*Width in In.*	*Total Built-up Height in In.*	*Approx. No. of Sheets*	*Approx. Wt. in Pounds*
(1)	7¾	1¾	8¾	535	27¼
(2)	9½	1¾	3½	215	13½
(3)	5⅝	1¾	3½	215	8
(4)	4¾	1¾	3½	215	6¾
(5)	7¾	3½	1¾	107	11
				Total	66½

Figure 1 illustrates the stacking of the middle portion of the core which makes use of wide punching (5) in the center leg. Figure 2 shows the lay-up for the two outside portions which use narrow punching (1) in the center leg. These figures show simply the relation of the various punchings of the complete core, and have no direct reference to the order of the assembly. Figure 3 is a dimensioned plan view of the assembled core and Figure 4 an elevation of it picturing the cruciform arrangement of the center leg.

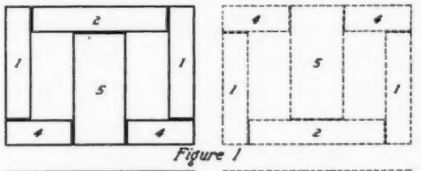


Figure 1

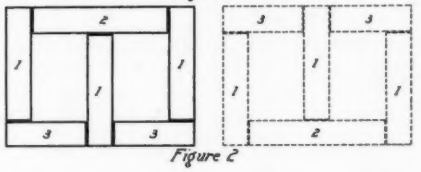


Figure 2

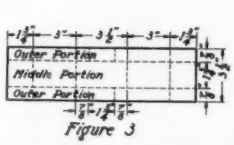


Figure 3

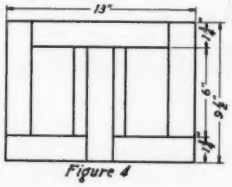


Figure 4

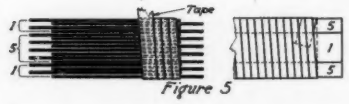


Figure 5

The punchings are stacked one or two at a time, each one or pair being reversed to alternate the joints (one set being represented by the full-line and the reversed set by the dotted-line sketches) in order, when clamped, to hold the core together. All joints are butted tightly, but not lapped nor opened, as so doing would increase core loss and exciting current.

Of course, the core, except for the center leg, is assembled around the completed coils and not the coils around the center leg. As a convenience in assembling, center leg punchings (1) and (5) may be stacked in proper relation as already indicated and tied together securely with a one-half lap wrap of cotton or similar tape. This holds the punchings together, brings the leg down to radial dimension by reducing bulging, and prevents the raw edges of the core from injuring the insulation on the inside of the coil when the latter is slipped over the core leg. Figure 5 suggests the arrangement.

Low-Voltage Windings

The coils for this transformer are of the form-wound type with the low voltage wound on a 4¼-in. round winding form. The high-voltage winding is wound on spacing strips over the insulated low-voltage winding.

This round winding form, such as a smooth wooden mandrel, serves to give circular shape to the coils and to furnish a support upon which the insulation and conductor are placed. To facilitate the separation of the coils and mandrel because of the binding of the coils upon the latter, the mandrel may be made from two pieces having their surfaces meeting at an angle to the axis of the cylinder, as shown in Figure 6. A blow against the small end of one of the halves will collapse the form and permits easy removal from the coil.

To prevent the possible tendency of a given layer to lengthen or to shift relative to another, the mandrel or winding form may be turned or built up so that plates or guides at each end, separated by a distance equal to the insulated length of the coil, confine the layers to proper dimensions.

Solid insulation to a radial thickness of 3/16 in. is wrapped around the winding form. This may be built up of insulating material or some combination of materials, such as parchment paper, fuller board, horn fiber, varnished cambric, etc. This insulation is available in thickness from .010 to 1/32 in. (10 mils to 32 mils). It may be applied in the form of a single pad, or preferably, of less thickness applied in two, three, or four layers with the ends lapping 1½ in. For the dimensions of the core chosen above, the width of this insulation is 5¾ in., as this dimension represents the insulated length of the coil.

The low-voltage conductor is 100 turns total of rectangular wire .150 by .120 in. (double cotton covered) having over-all insulated dimension of approximately .165 by .135 in. Ten pound are required.

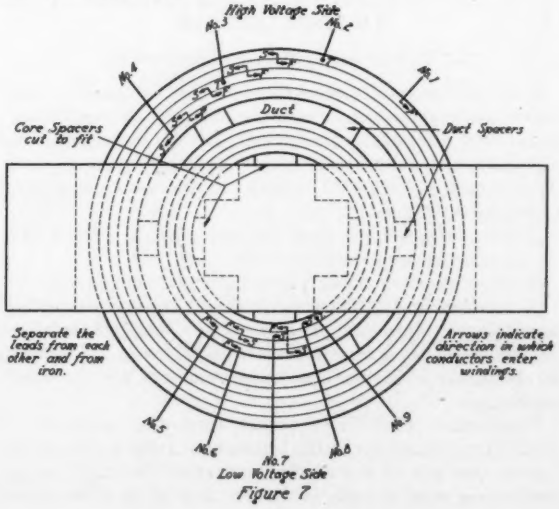


Figure 7

A conductor of .150 in. width distributed in an even number of layers (four on account of the series multiple arrangement provided) requires a winding layer of about 4½ in. This layer will accommodate approximately 25 turns. The turns-per-layer allowance is sufficient to absorb the axial "spread" of the winding caused by taking off the three-phase two-phase tap from the first layer.

Layer insulation of 10 mils minimum thickness and 5¾ in. width is placed over each of the four layers. Four pieces, respectively 17, 18, 19, and 20 in. long are required.

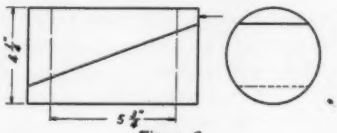


Figure 6

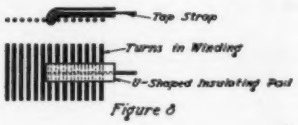


Figure 8

Coil and tap lead markings are shown in Figure 7. The direction of winding may be as shown in that figure and represented by "starts" (s). To prevent pulling out due to handling, outside starting and finishing leads should be bound in place with a thickness or two of tape wrapped around them and anchored smoothly to the body of the winding by catching the end under the last turn of tape about the coil and drawing it tight.

The coil leads may be the conductor brought out, insulated with tape or cambric wound half-lap. This insulation should protect the leads particularly at the points where they emerge from the layers and should extend an inch or more into the coil. The two middle layers are wound continuously with the crossover between them being inside of the coil. The two outer layers are wound in such order that the crossover between them must be outside of the coil, suitably soldered and insulated. This arrangement makes the two halves of the low-voltage winding equal in resistance and reactance because of the same average mean length of turn. Note that the fourth or last layer is started as though continued from the first layer without interruption.

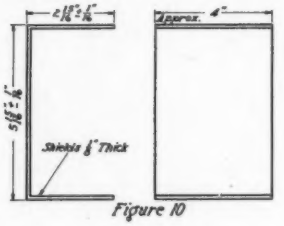
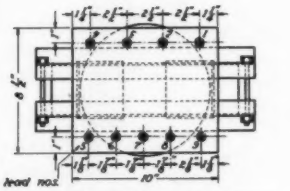


Figure 10



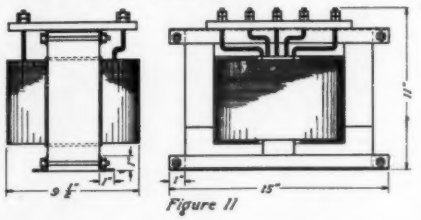


Figure 11

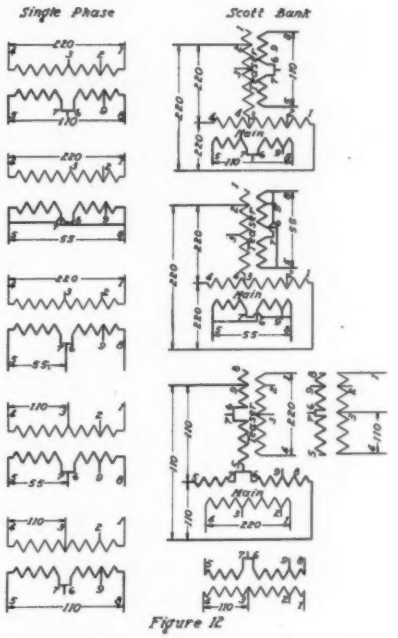
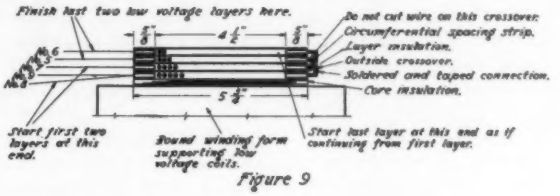


Figure 12

Low-voltage tap No. 9 is made at the specified turn by soldering or brazing a sufficiently long piece of conductor, or, much better, two flat strips of .500 by .010 in. copper, four ends out, or four strips of .250 by .010 in. copper, eight ends out, to obtain necessary cross sections. It will be appreciated that a flat strip or even a flat flexible conductor can be wound upon with less radial "bulge" of the winding over it, and the less likelihood of sheared insulation to cause short-circuit failure, than if thicker conductor were used. All joints are made and taped carefully and smoothly. The tap strap is insulated throughout its length as specified for the coil leads. In addition, a U-shaped pad of a thickness or two of varnished cambric or horn fiber about 1½ in. wide, and a folded length to reach an inch beyond the end of the coil, should be used, as shown in Figure 8. The remainder of the layer beyond the tap may well be filled out with any sort of insulation to give the layer the same bulge throughout in order that the layers above may be wound evenly along their full length.

Low-voltage teaser tap No. 9 must be brought out at 13 turns from the start of the inner layer (considering coil lead No. 8 as the start as already indicated).

To maintain safe electrical distance between coil conductor and ends of coils, circumferential spacing strips of pressboard, or similar insulation, of thickness not to exceed the insulated thickness of the wire, are placed at the ends of each layer as suggested in Figure 9. A total of eight pieces, ⅝ in. wide


Finish last two low voltage layers here.
Do not cut wire on this crossover.
Circumferential spacing strip.
Layer insulation.
Outside crossover.
Soldered and taped connection.
Core insulation.
4½"
5¾"
Start first two layers at this end.
Bound winding form supporting low voltage coils.
Start last layer at this end as if continuing from first layer.
Figure 9

at one end and ¾ in. wide at the other end, are required as stock to be trimmed as necessary. Two each are respectively 16, 17, 18, and 19 in. long. These should be bound securely to hold them in place and thus to maintain the winding layer. This may be done by placing loops of tape about these strips and winding the conductor over them after first leaving the ends exposed so that the slack may be pulled out of the loops. The method used is very similar to that of "whipping" the ends of a rope.

Inasmuch as this transformer is designed as an air-cooled unit, an air duct of ½ in. radial thickness is maintained around and outside of the low-voltage winding by six spacers ½ in. wide and 5¾ in. long disposed equally about the circumference so that two of them are located centrally beneath the outer leg iron.

Insulation, the same as used over the core, is placed over the spacers and beneath the high-voltage winding, which winding is wound over the low-voltage winding and spacers as a form.

High-Voltage Winding

The high-voltage winding is of 200 turns total whose conductor is .102-in. round wire (enamel, double cotton covered) having an insulated diameter of approximately .115 in. Thir-

teen and three-fourths pounds of this wire are required for this part of the job.

This is wound in one coil of five layers of about 40 turns per layer in a winding layer of 5 in. One piece of insulation (horn fiber is good) of 10 mils minimum thickness and 5¾-in. width is placed over each layer including the outer one, the respective lengths being approximately 24, 25, 26, 27, 28, and 29 in.

In a manner similar to that explained in regard to the low-voltage winding, end spacing strips ⅜ in. wide at one end and ½ in. wide at the other end of a thickness not to exceed the insulated diameter of the wire, are required to maintain the winding layer and to separate the winding from the core. A total of 10 pieces are required, there being two pieces each 23, 24, 25, 26, 27, and 28 in. long.

High-voltage lead No. 4 is brought out at the top of the coil from the first inside layer and lead No. 1 out from the bottom end of the outer layer because of the odd number of layers. Material and insulation for these leads may be conductor as described for the low-voltage winding. However, flexible, braided copper strip, if available, may be used in place of coil conductor, if desired.

High-voltage teaser tap No. 2 must be brought out at 173 turns from the start of the inner layer (considering coil lead No. 4 as the start) and conducted out of the bottom of the coil. The remainder of the fifth layer may be wound over the tap to hold it down mechanically. Insulate with a U-shaped pad and bulge the remainder of the layer as already described.

It will be noted that both teaser taps are so located that they do not affect the duct between low-voltage and high-voltage windings, thus not varying the reactance between them.

Table of Connections

Single-Phase Transformer

High Voltage			Low Voltage			
Volts	Line Amperes	Lines On	Volts	Line Amperes	Connect	Lines On
220	6.82	1 and 4	110	13.64	6 to 7	5 and 8
220	6.82	1 and 4	55	27.28	5 to 6 7 to 8	5 and 8

Single-Phase Three-Wire

220	3.41	1 and 4	55	13.64	6 to 7	5 and 7
110	6.82	3 and 4	55	13.64	6 to 7	5 and 7
110	6.82	3 and 4	110	6.82	6 to 7	5 and 8

Scott Bank

Main Transformer

Three Phase				Two Phase			
Volts	Line Amperes	Connect	Lines On	Volts	Line Amperes	Connect	Lines On
220	6.82	3 to Teaser 4	1 and 4	110	13.64	6 to 7	5 and 8
220	6.82	3 to Teaser 4	1 and 4	55	27.28	5 to 6 7 to 8	5 and 8
110	13.64	6 & 7 to Teaser 5	5 and 8	220	6.82		1 and 4
110	6.82	6 & 7 to Teaser 5	5 and 8	110	6.82		3 and 4

Teaser Transformer

220	6.82	4 to Main 3	2	110	13.64	6 to 7	5 and 8
220	6.82	4 to Main 3	2	55	27.28	5 to 6 7 to 8	5 and 8
110	13.64	5 to Main 6&7	9	220	6.82		1 and 4
110	6.82	5 to Main 6&7	9	110	6.82		3 and 4

Figure 13

Tap No. 3 for three-wire operation must be brought out at 100 turns from the same start of the winding. This is the mid-point of the middle layer if all layers are wound with an equal number of turns (40 per layer).

Core and Coil Assembly

The completed coil unit is assembled on the core already mentioned. Four core spacers are fitted snugly between, as shown in Figure 7.

To separate the insulated coil from the outside core legs, two shields of ⅛-in. thick solid insulation, such as pressboard, are used, of dimensions shown in Figure 10. The purpose of these shields is to protect the windings electrically against ground and must not be omitted. The outside core legs are then assembled over these shields.

Wood or metal core clamps are necessary in order to hold the core together. One-inch angle iron and ¼-in. diameter bolts combine to make a simple but acceptable clamping structure as indicated in Figure 11. The bottom angles are turned outward to provide feet for the support of the core, and the top ones inward to provide a mount for the connection board.

This board may be dry and clear wood, such as maple, or of hard fiber. The latter has the advantage of greater strength electrically and mechanically, and hence thinner material may be used. Refer to the above figure for arrangement of parts.

Developed Windings and Table Connections

Figure 12 symbolizes the developed windings and leads referred to in the opening paragraphs of this specification. This, together with the table of connections, represented by Figure 13, should make clear the connections which can be made and studied by the electrical student with this transformer in the school shop.

General

A few turns of a single thickness of cotton tape may be used as occasion requires for either axial or circumferential binding to hold parts together.

To assist in doing this, the coils may be brushed with an oil varnish of the Feldspar type as they are being wound. After removal from the form they should be given an external coating on all surfaces followed by a 24-hour oven bake at a temperature of 100° C. The drying of the liquid will cause it to serve as both a mechanical binder and an electrical insulator.

Core spacers and duct spacers may be of dry wood or of heavy fiber, or pressboard built up to proper thickness by shellacking the laminations together, and oven-drying as described. Spacers are made moisture resistant by dipping in hot insulating oil or paraffin.

The insulation over the core and that over the duct spacers should be preferably of built-up material, including both fiber and cloth in its composition.

It is desirable to give the windings a high potential test to check their proper insulation between winding and core. To prepare to do this, the high-voltage line and tap leads are electrically tied together with a length of bare copper wire. Next, the low-voltage winding and the core are connected together and to ground (the iron structure). A potential of 4 kv is then applied between the high-voltage winding and ground.

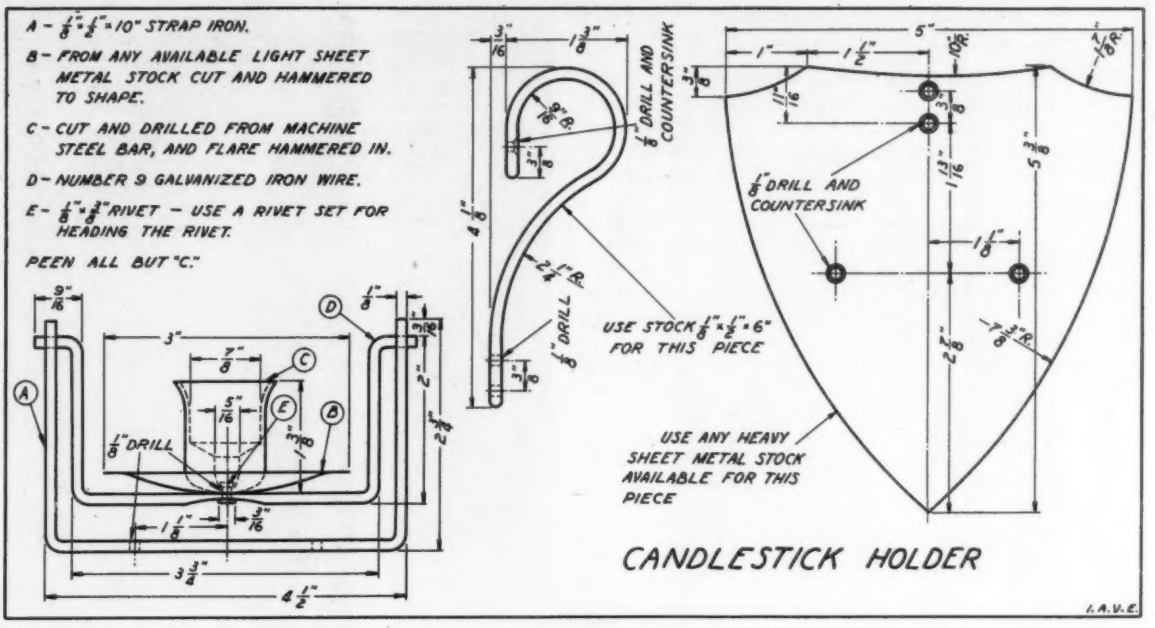
The low-voltage winding should be tested similarly by connecting the high-voltage winding to ground and again applying 4 kv between the low-voltage winding and ground.

This transformer, being an air-cooled design, does not require a tank as it would were it oil-cooled, nor is a screen or casing necessary. However, if desired, a perforated sheet-metal or heavy-wire-mesh casing of round or rectangular floor plan with perhaps a perforated wood base and top may be constructed, and the coil and tap leads brought through the top or to terminal studs in it.

The total weight of the transformer is about 85 pounds. The projected floor space is approximately 9½ by 15 in., and height over terminal studs 11 in. It should be lifted by placing the support under the core and bottom clamps.

The Scott connection referred to is the familiar 3-phase 2-phase interconnection of "main" and "teaser" transformers. The transformer is interchangeable as main and teaser, in that both high-voltage and low-voltage windings have "main" taps for 50 per cent of the full winding voltage, and "teaser" taps for 86 per cent of the full winding voltage.

A transformer built to this specification should provide profitable reaction in its construction and subsequent use. Its characteristics have proved to be very satisfactory by actual test.

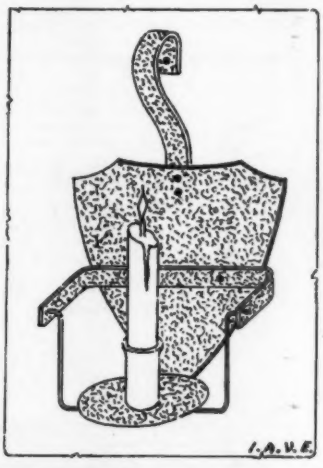

A - 1/8" x 1/2" x 10" STRAP IRON.
B - FROM ANY AVAILABLE LIGHT SHEET METAL STOCK CUT AND HAMMERED TO SHAPE.
C - CUT AND DRILLED FROM MACHINE STEEL BAR, AND FLARE HAMMERED IN.
D - NUMBER 9 GALVANIZED IRON WIRE.
E - 1/8" x 3/8" RIVET - USE A RIVET SET FOR HEADING THE RIVET.
PEEN ALL BUT "C."
1/8" DRILL AND COUNTERSINK
USE STOCK 1/8" x 1/2" x 6" FOR THIS PIECE
USE ANY HEAVY SHEET METAL STOCK AVAILABLE FOR THIS PIECE
1/8" DRILL AND COUNTERSINK
CANDLESTICK HOLDER
I.A.V.E.

Details of the candlestick holder

CANDLESTICK HOLDER

Edward Amos, High School, Bucyrus, Ohio

The candlestick holder shown herewith makes an interesting problem for the metal-working shop. The material used is very inexpensive, and much of it may be salvaged from the scrap heap. It embodies layout work, cutting and filing, bending, some turning, forming, riveting, and peening.



A suitable finish may be applied by giving the project a coat of black lacquer or enamel. After this has dried, rub the surface with emery paper to bring out the highlights, after which one or two coats of clear lacquer may be applied to prevent the highlights from rusting.

HANDY COLD GLUE AND BRUSH CONTAINER

Louis F. Barocci, Cudahy High School, Cudahy, Wisconsin

It is often more convenient to use cold glue than warm glue. Experience, however, has proved that students frequently fail to place the cover back tightly on the glue can when they are through using the glue. As a consequence, the liquid element in the glue evaporates, rendering the glue unfit for use.

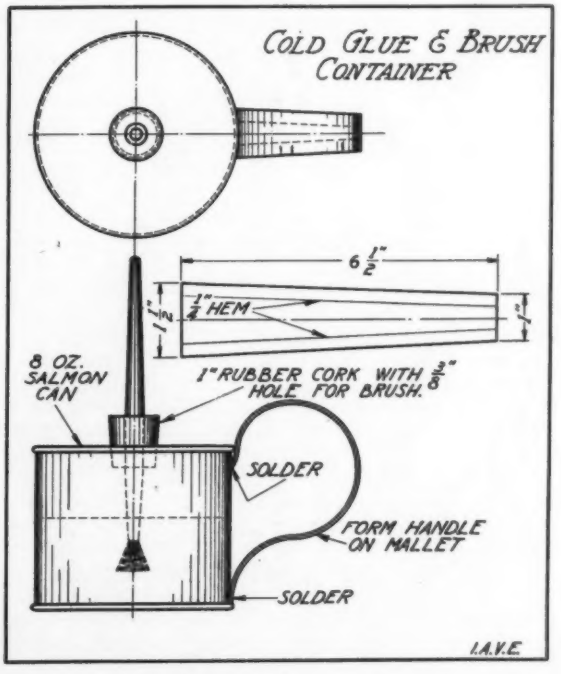
The glue container described herewith makes the glue instantly available for use, as the brush is kept in the glue itself, thus avoiding the necessity of making a sliver of wood with which to apply the glue every time glue is needed.

The brush is forced into a 1-in. rubber cork which has a 3/8-in. hole lengthwise through its center. The cork itself fits snugly into the top of the glue can thus making the can airtight, keeping the glue at the proper consistency at all times. An 8-oz. salmon can serves the purpose very well.

Before the cover is soldered to the can, the 3/4-in. hole must be punched in the center. The handle is made of 20-gauge tin plate with a 1/4-in. hem on each edge for reënforcement, then shaped around a mallet and soldered to the can. A small paintbrush of the type used in the art department of the school, serves the purpose of glue brush nicely.

When the glue is needed, merely remove the cork from the container. Do not attempt to remove the brush from the cork.

This type of cold-glue container has been in use in our woodshops for two years and has proved to be a time as well as a glue saver.



Details and assembly of glue container

CONNECTICUT CHEST

Burl N. Osburn, Millersville, Pennsylvania

The tulip and sunflower panels, turned appliques, and moldings make the Connecticut Chest[1] described herewith one of the most interesting examples of American furniture of the early period. Both in construction and ornamentation, it shows the Gothic influence, and the rather primitive methods of the early joiner.

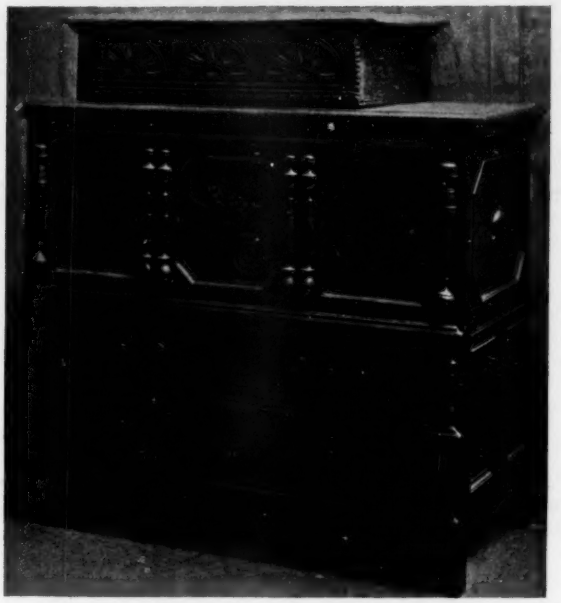
When considering dimensions of an old piece such as this, it will be found that measurements of the same part will not agree at any two places, or that edges have been worn or knocked away, making it necessary to use one's judgment in selecting parts for measuring that seem typical, or as nearly in the original condition as possible.

The upper part, which is the real chest, is inclosed by plain end panels, plain back panels, and the low, flat-carved ornamental panels in front. Front and end panels are beveled on the inside, while the back panel has the bevel turned out. Moldings are fit around the front panels, with the top flush with the surface of rails and stiles. On the ends the molding projects about ¼ in. above the surface.

Two long drawers are placed below the chest, each divided on the front into three panels by moldings which are also flush with the rails and stiles. These drawers have sides of oak, grooved out to run on strips fastened to the legs. Drawer bottoms and backs are of pine. Round brass pulls are placed in the center of the end panels on each drawer, and flanked by two black "turtle-backs."

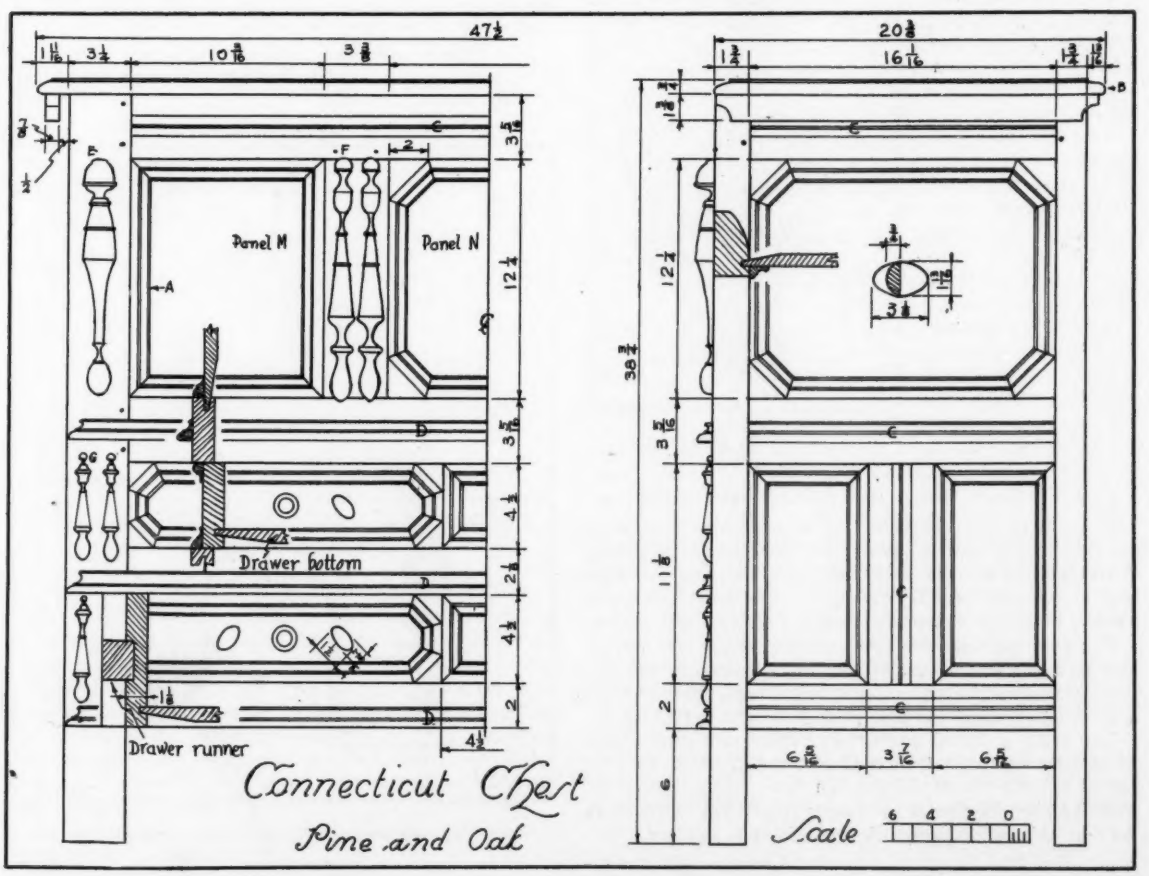
Long strips of molding, shaped at the ends, are fastened above, between, and below the drawers. Half-round spindles are attached on the front to the stiles. Two types are used on the upper part, and a third and smaller type at the ends of the drawers. An ornamental groove is molded across the top front and end rails, top, center, and lower end rails, and end center stiles. Bosses, or "turtle-backs," are applied to drawer fronts and upper end panels. Bosses, spindles, molding, and grooves are all painted black, probably in imitation of ebony.

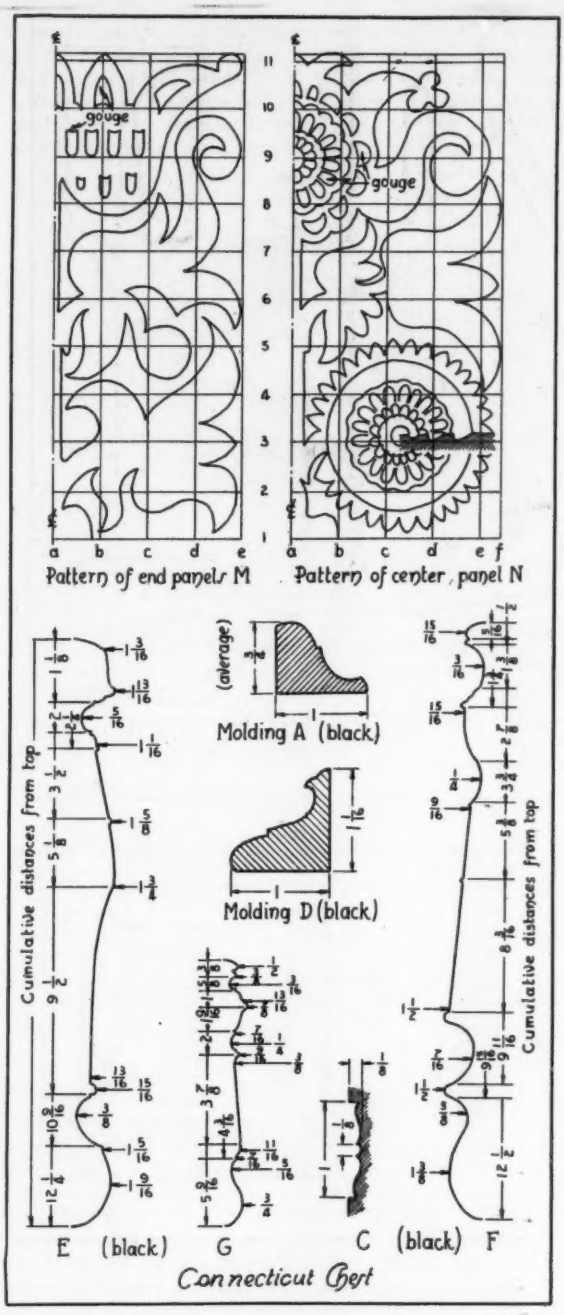
Much of the interest centers in the three carved panels on



Connecticut chest (Photograph from the Brooklyn Museum)

[1]Property of the Brooklyn Museum.





Connecticut chest details

the front. The tulip designs on the two front panels are thought to have their origin in the Low Countries. All of the carving on these panels is of the flat, two-plane type, done mostly with gouges. The designs in the drawing are reproduced by pantograph from rubbings.

A MAGAZINE RACK THAT IS DIFFERENT

W. Ben Hunt, Hales Corners, Wisconsin

(See Supplement No. 278)

The magazine rack described and illustrated herewith makes an interesting project for the advanced student of woodworking. It embodies not only the ordinary cabinet-making but also turning and fluting.

The original was made of cherry and finished with a light-oak stain. However, other woods may be used, and the project

Magazine rack

finished so that it corresponds with the furniture in the room in which the magazine rack is to be used.

THE TOASTING FORK

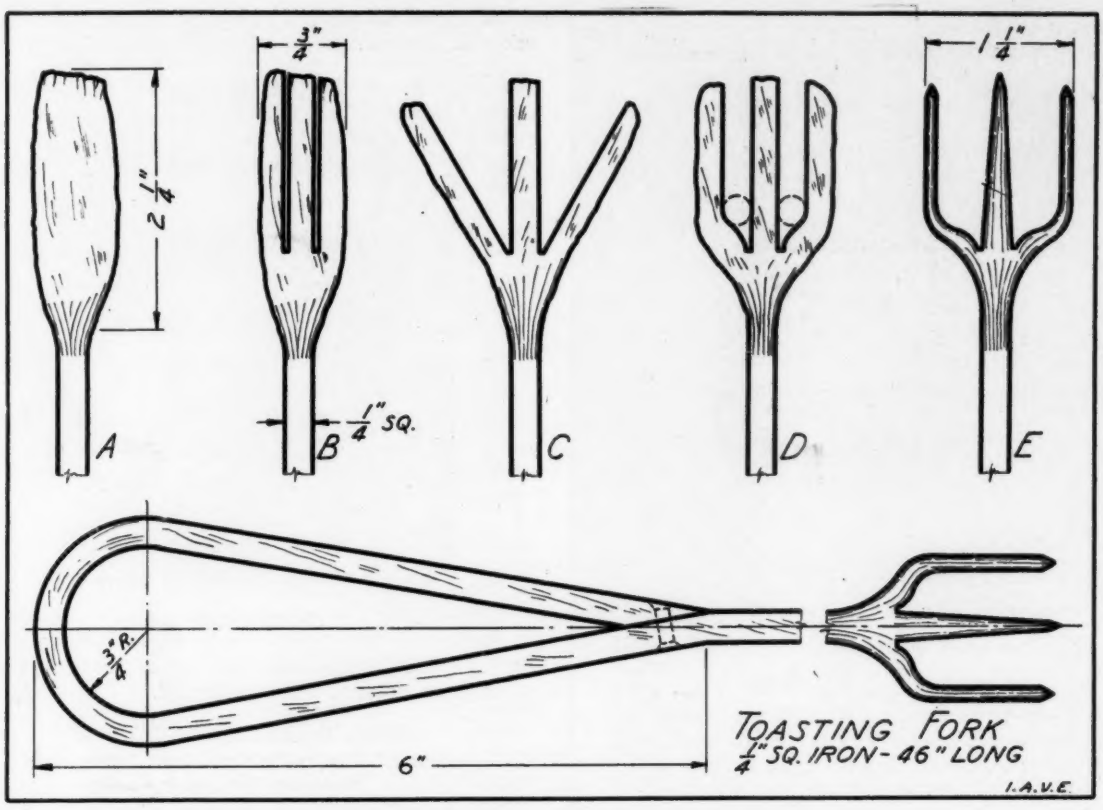
Albert D. Mowery, Industrial-Arts Instructor, Rumson, New Jersey

The toasting fork is a metal-working project that has much to recommend it. It makes an excellent "beginning project" and also an excellent "finishing up" project. The reason for this is that a small amount of time is involved, and should additional time remain, two or more may be made without loss of interest or utility. The cost is not above ten cents each.

To make the toasting fork, secure a piece of ¼-in. square iron rod 46 in. long. Heat the end in a gas furnace or any other fire which is hot enough for the purpose, and hammer out the end, as shown at A in the illustration herewith. After the rod is cool, make two hack-saw cuts as indicated at B. Heat again and bend the two outer prongs at an angle as indicated at C. Care should be taken that the angles are as near equal as can be estimated. If sufficiently hot, the pieces can be pulled away from the center with a pair of pliers. Now clamp a round bolt or rod horizontally in the vise, allowing it to project a little beyond the jaws. Place the hot rod over this bolt, as shown at D, and tap lightly with a hammer until each of the tines are parallel. Then file the tines to shape, as shown at E, after which the file marks should be removed with emery cloth.

The handle is made by heating and flattening the opposite end for about 1½ in. and hammering it thinner than the tine end. Form the loop as indicated in the illustration, and then bend the whole rod back for a distance of 6 in. It is not necessary to heat it for this bend. Use a ⅛-in. rivet as indicated. Polish the whole rod with emery cloth to as bright a finish as desired. One or two coats of clear lacquer will prevent rusting. A coat of flat black lacquer is also very effective.

If one wishes to make the toasting fork even more attractive and "professional" looking, the portion between the handle and the tines may be given a twist of from three quarters to one full turn. This twist should start at the handle and extend a distance of about 3 in. Tiny barbs also may be cut on the tines to help restrain the elusive "hot dog" or marshmallow from slipping off. It is also a good plan to provide a



large cork or a piece of white pine into which the tines may be forced when the fork is not in use. This not only prevents accidents but prevents the points from being bent out of shape when they strike hard objects.

THE WALL PLAQUE AS A BEGINNING PROJECT IN WOODWORKING

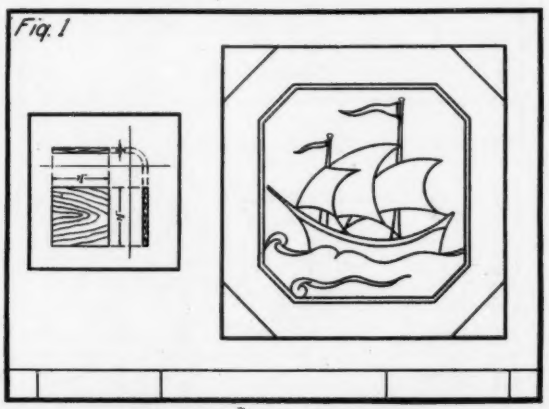
Herbert C. Downing, Forest Hills Junior High School, Pittsburgh, Pennsylvania

The wall plaque described in this article embodies all of the fundamental processes in woodworking and yet holds the interest of the pupil to the very end. It not only helps the pupil to learn the primary essentials of woodworking, but also gives him an opportunity for self-expression which is by far the most important point in favor of any project for the junior-high-school level.

Method of Procedure

The instructor first displays some plaques made either by himself or by some of the boys who attended his classes in previous years. He then announces that each boy is to bring a design or drawing for a similar plaque to the shop at the next class period. The boy is told also that he must choose a design which can be worked out in dark and light areas rather than in colors or in shadings, and it is especially emphasized that the design must be the boy's own work. The type of work usually brought in by the boys consists of characters from the comic strips, scout badges, sailboats, and geometric designs.

When the class meets for the next period, the students are shown how to arrange and redraw their design full size on a sheet of drawing paper. Since the design occupies a space 7½ by 7½ in. on the drawing sheet, there is little room left above or below for anything else. This makes possible a discussion of three-view projections and scale drawings as a solution to the problem of how to indicate on that same sheet the size and thickness of the board to be used. To complete the drawing a three-view projection is drawn to the scale of 3 in. equals 1 foot on the same sheet, but to one side of the full-sized drawing, as shown in Figure 1.



The mechanical-drawing lesson

Squaring Up the Stock

This problem, usually looked upon as a drudgery, comes as near being overlooked by the boy when he squares up stock for the plaque as any the writer has ever observed. The instructions given are that the surface must be planed flat and the four sides squared. This brings the plane and the try-square into use, and also shows the value of the face mark. The boys are urged to learn the different adjustments and correct ways of using the plane as soon as possible, since a tool is to a workman what a car or airplane is to a motorist or aviator — the means by which his goal is attained.

The plaque in this step is taking the place of the old practice-planing piece; therefore, no specifications are given for

thickness. The boys soon discover for themselves that it does not take long to plane away enough of the board so that the plaque, instead of being ¾ in. thick, is going to be much less. This fact is brought home to the boy much more quickly than the instructor could do with a demonstration, no matter how carefully he might prepare and give it.

The pencil drawing with dark areas blackened

The material used for the project is yellow poplar, although any fine-grained, soft-textured wood is suitable. A piece ¾ by 7½ by 7½ in. is passed out to each member of the class after the instructor has given a detailed demonstration of the plane and the process of planing a surface, edge, and end of a board.

Sanding the Surface

The fact that the first lesson in staining follows so closely the first experience in sanding makes this project an excellent lesson for pointing out the necessity of removing every mark on the board in the sanding operation. Any carelessness in this step is made so obvious when the stain is applied that one rarely ever needs to mention the point again. The instructor's experience has been that there is more of a tendency for the student, in his later work, to overdo rather than neglect this step.

Cutting the Design

Before transferring the design from the original drawing (the one brought to class the second day) to the board, it should have the areas which are to be dark, blackened with pencil, as shown in Figure 2. This will give the boy an opportunity to see how his design will look when it is completed. After the drawing has been shaded, it is transferred to the sanded surface of the board with carbon paper, and a V-shaped groove cut along each line of the design with a sharp penknife. These grooves form the boundary lines between the light and dark areas and also give an appearance of burnt lines when stained.

Finishing the Surface

Using the blackened drawing, Figure 2, as a guide, cover all the light areas of the design with shellac (stock concentration), using a small camel's hair paintbrush. Usually two or three coats are necessary to completely seal up the grain of the wood. Next, apply oil stain over the entire surface of the board, but wipe it off immediately to prevent its soaking in under the edges of the shellacked areas. As soon as the stain is dry, the surface is washed with alcohol to remove the shellac which was used to protect the light areas. This leaves a uniform surface for building up any routine order of finish the instructor wishes to present. The most satisfactory one has been to build up a good surface with diluted shellac, being careful to rub each coat with steel wool before applying the succeeding one and finishing off with a coat of wax. For the boys who wish to finish the picture a little more attractively, a border of machine-cut molding (see Fig. 5) gives the final product a more outstanding appearance. This also adds one more initial experience to this beginning project — the miter joint.

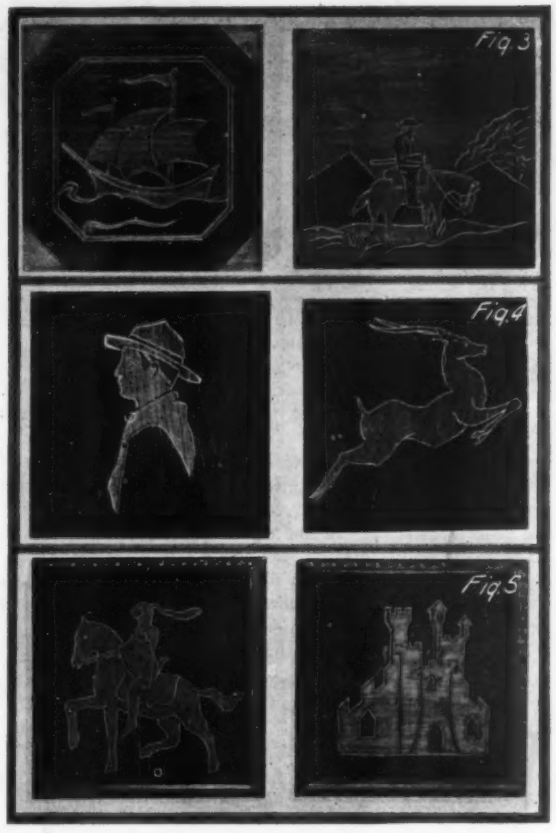


Fig. 3. The finished plaque; made by an eighth-grade boy taking woodwork for the first time.

Fig. 4. Samples of work done by junior-high-school boys.

Fig. 5. Plaques finished with molding; made by seventh-grade pupils.

OPERATION SHEETS FOR MACHINE WOODWORK

V. E. Broadbent, Instructor Industrial Arts, Santa Clara, California

Operating the Single-Surface Planer

Use

The most common use for the surfacer is to plane rough lumber to a definite and uniform thickness. It will not true up a board crooked lengthwise.

Tools

Single surfacer, try-square.

Directions

1. Before starting the machine, lower the table by means of the handwheel until the table is too low.
2. Raise the table until, according to the scale fastened on the left side, the surfacer is set to cut 1/16 in. This is the biggest amount advisable for most work.
3. Start the machine and shove the board beneath the corrugated feed roll (See Fig. 1) which will move the board through the rest of its travel with the aid of the smooth-feed rear-table roll.
4. When starting the board through, hold up the rear end slightly so that the weight of the board will not force up

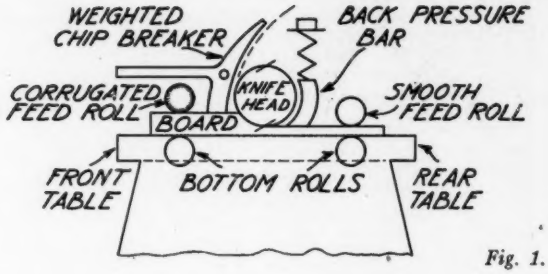


Fig. 1.

the chip breaker (see Fig. 1) and cause the cutting knives to gouge the front end of the board.

5. Likewise, raise the front end of the board when the board is nearly all through the surfacer. This will prevent the back-pressure bar being sprung up and a gouge made in the end of the board.

6. If the surfacer begins to slow up, push in the feed lever which will stop the feed rollers. When the table has been lowered a trifle and the knives have picked up speed again, shift the lever again. Do not try to plane so much that the planer constantly stops.

7. When one side has been planed, plane the other side and continue planing until the desired thickness is reached. Check the work with the try-square constantly.

8. Be careful to plane in the direction of the grain.

9. When a board is very crooked, plane a face true on the jointer before sending it through the surfacer.

10. Don't send more than one board at a time through, as one may be held insecurely by the feed roller and kicked back.

11. If the board catches at the start, slightly raise up on the chip breaker by means of the handle. It may also be held up when a rough board is first sent through.

12. If the board still catches, the back-pressure bar is too low (see Fig. 1). Report to instructor and he will make the proper adjustment.

13. Do not run stock shorter than 18 in. through the planer.

14. Do not stand directly back of the surfacer. A kick-back may occur.

15. Do not reach or pass board over the planer. Loss of a hand or arm might result.

16. In planing several boards to the same thickness, run all of them through at each setting before changing it.

Questions

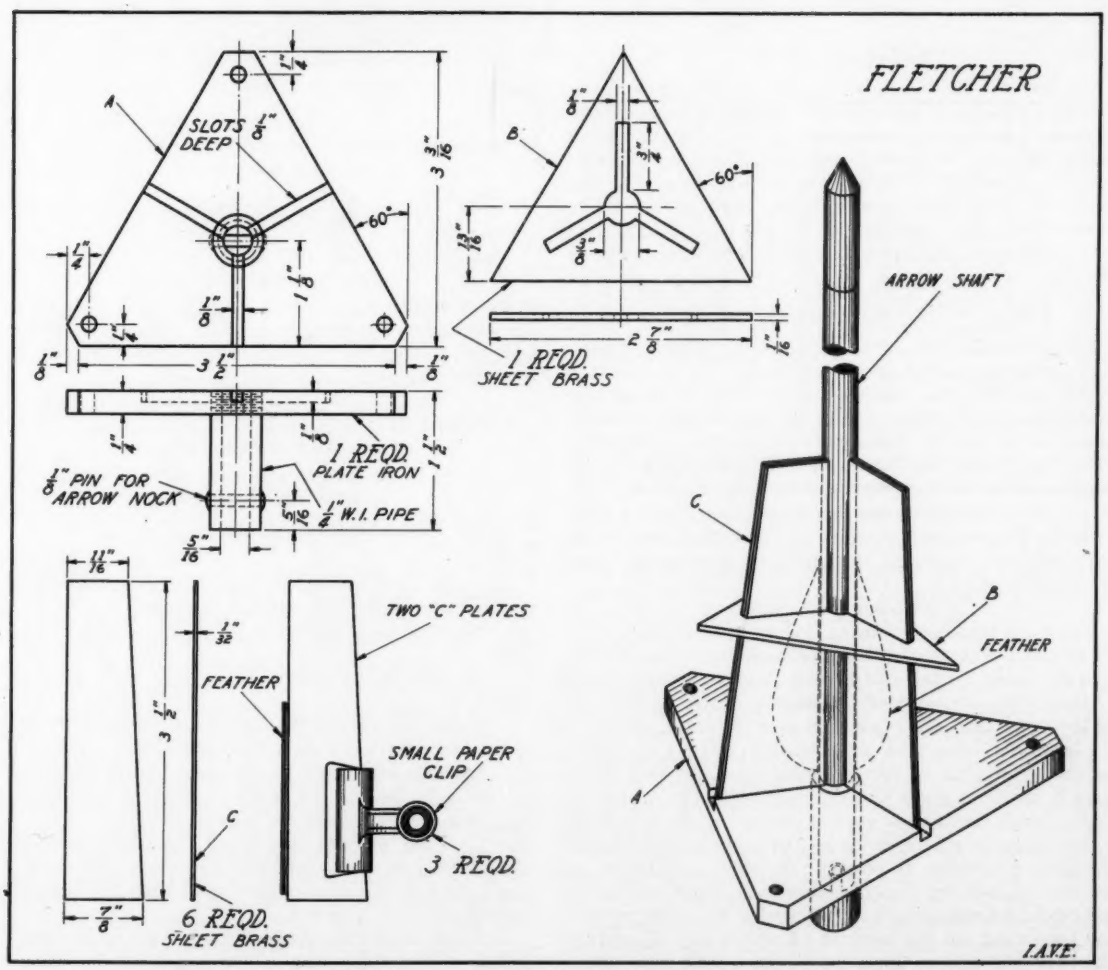
1. How is the corrugated feed roll held down on the work?

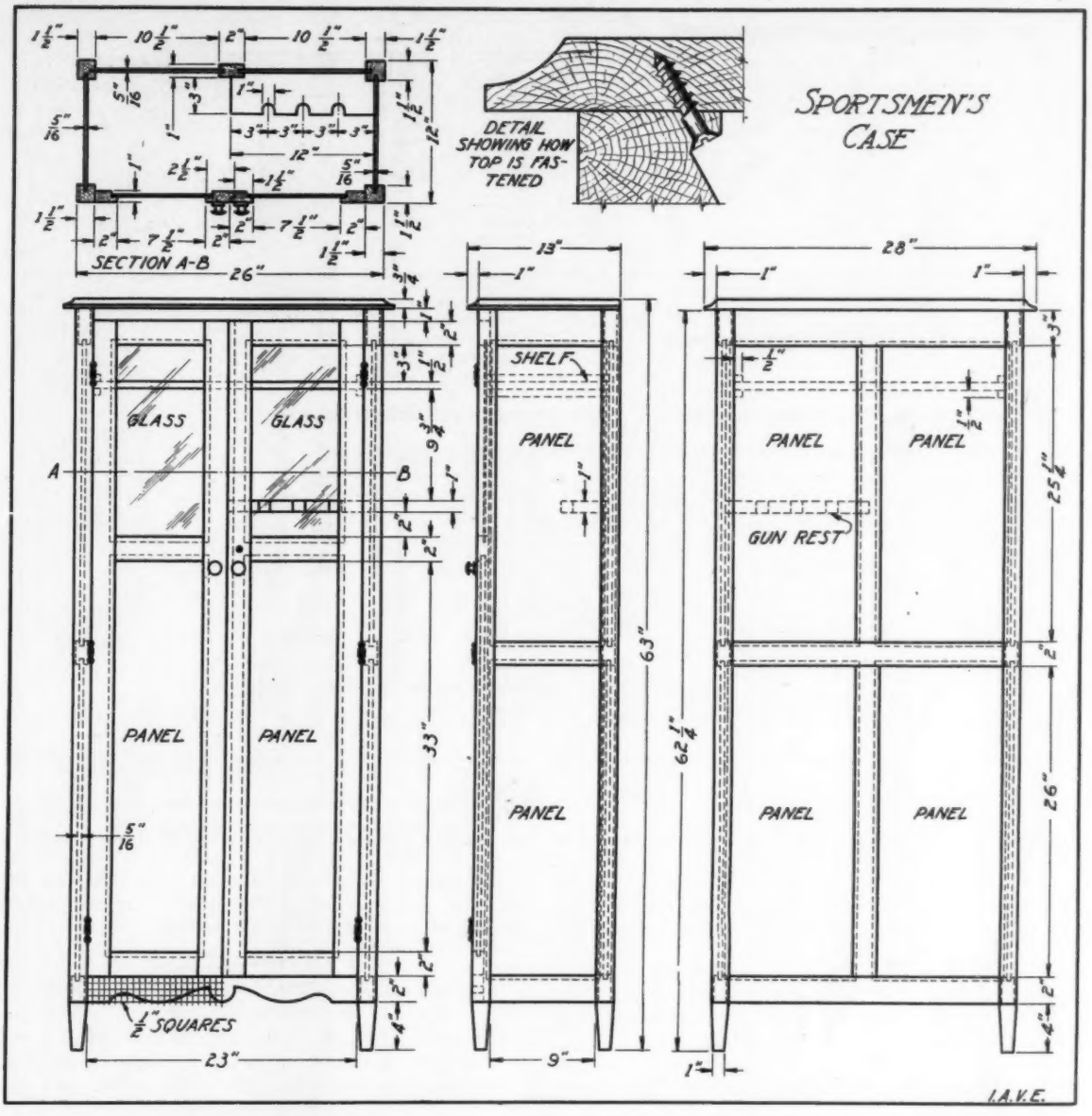
2. If the board is slightly crushed, what adjustment should be made?

3. How should boards be planed that are going to be cut into short lengths?

Reference

Hunt's *Manual for Machine Woodworking*, pp. 31–40.





A HANDY FLETCHER

I. H. McVey, Ingalls Junior-Senior High School, Atchison, Kansas

Fletching is one of the archer's most difficult tasks, and if the feathers are not accurately placed on the shaft of the arrow, the score of the archer will be low.

The fletching jig illustrated and described herewith is easy to construct. It will be found very handy by the archer.

The construction of the jig is shown in the illustration. Place a length of feather between two plates and clamp them together with a paper clip. Be sure the three feathers used on an arrow are all from one side of the bird.

Prepare the remaining two feathers in the same way as just described, and place them around the shaft of the arrow. Then clamp them in place with clamp B. Any fast-drying glue may be used. However, it is best to use a waterproof fletching glue.

THE SPORTSMAN'S CABINET

Louis F. Barocci, Cudahy High School, Cudahy, Wisconsin

The sportsman's cabinet is a necessity for the out-of-doors man, yet few of these men have a place to keep their guns, fish poles, fishing tackle, shells, golf clubs, golf balls, tennis rackets, etc. It was with this idea in mind to have a place for all of this paraphernalia that the cabinet, herewith described, was designed.

This cabinet, when properly constructed and finished, makes a piece of furniture which is both useful and beautiful. It may be constructed of birch, oak, gum, or walnut. All panel work is set in 3/8 of an inch.

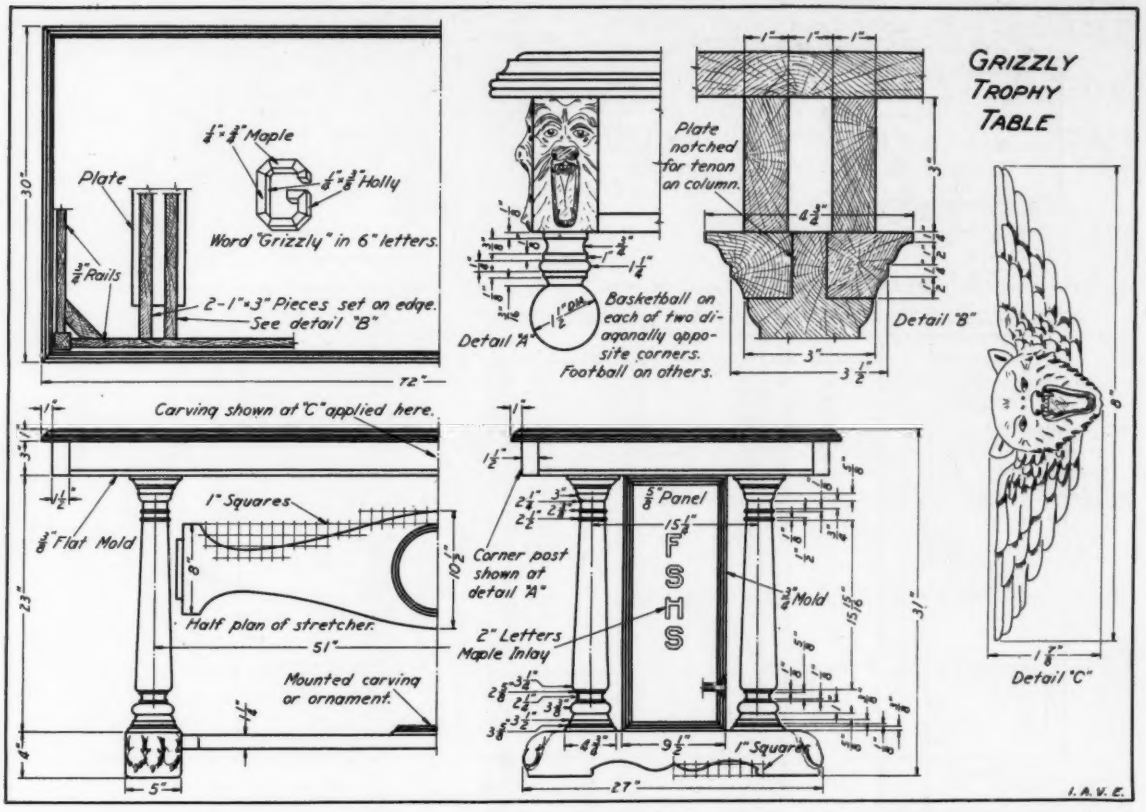
A TROPHY TABLE

F. M. Keith, Senior High School, Ft. Smith, Arkansas

The building of a trophy table is a tribute to the athletic teams, but it is also a bit of fine advertising for the industrial-arts department. Such a table may be placed in the trophy room, or, if the athletes are not fortunate enough to have such a room in the building, it may be placed in any convenient space in a wide corridor.

The table described in this article was placed in a foyer between the general office and the school library.

The name given the school team is "Grizzly" and the table was designed around a "grizzly" motif. The carving in the



Details of trophy table

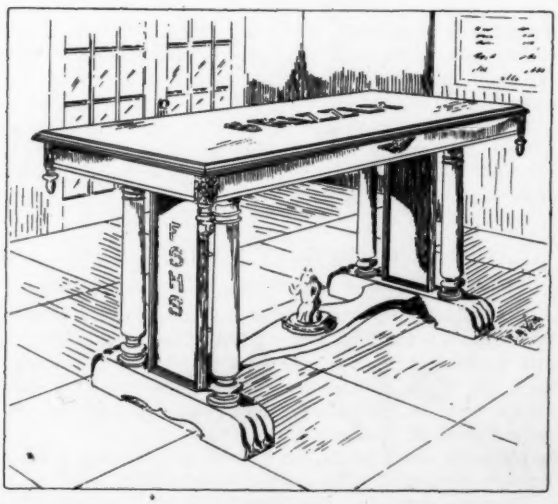
center of the stretcher is a bear holding a ball under one arm. Thus, any team name might be worked in.

The small carvings and the feet may be carved in the school shops, or, failing there, they may be done in an industrial plant. Any wood-carving craftsman can work them up from drawings.

The inlaid letters on the table top show up well on a piece of this kind, giving a unique appearance. A band also might be inlaid around the top and another on the end panels might be used to inclose the initials of the school.

The columns supporting the table give a novel effect and are to be preferred to a solid supporting piece. These columns are mortised into the plate and into the crosspieces near the floor.

The balls are turned on the corner posts. The footballs should be turned separately and attached to the post so as to have the long axis in a horizontal position.



Trophy table

A BEDSIDE STAND

Edward H. Crussell, Stanford Junior High School, Sacramento, California

Among the good points of the bedside stand shown in the drawing is its many-sided usefulness. It might be called an all-purpose stand. Telephone, plant, lamp, reading, work, tea, smoking, game board — it has been used for all of them.

Bedside stand

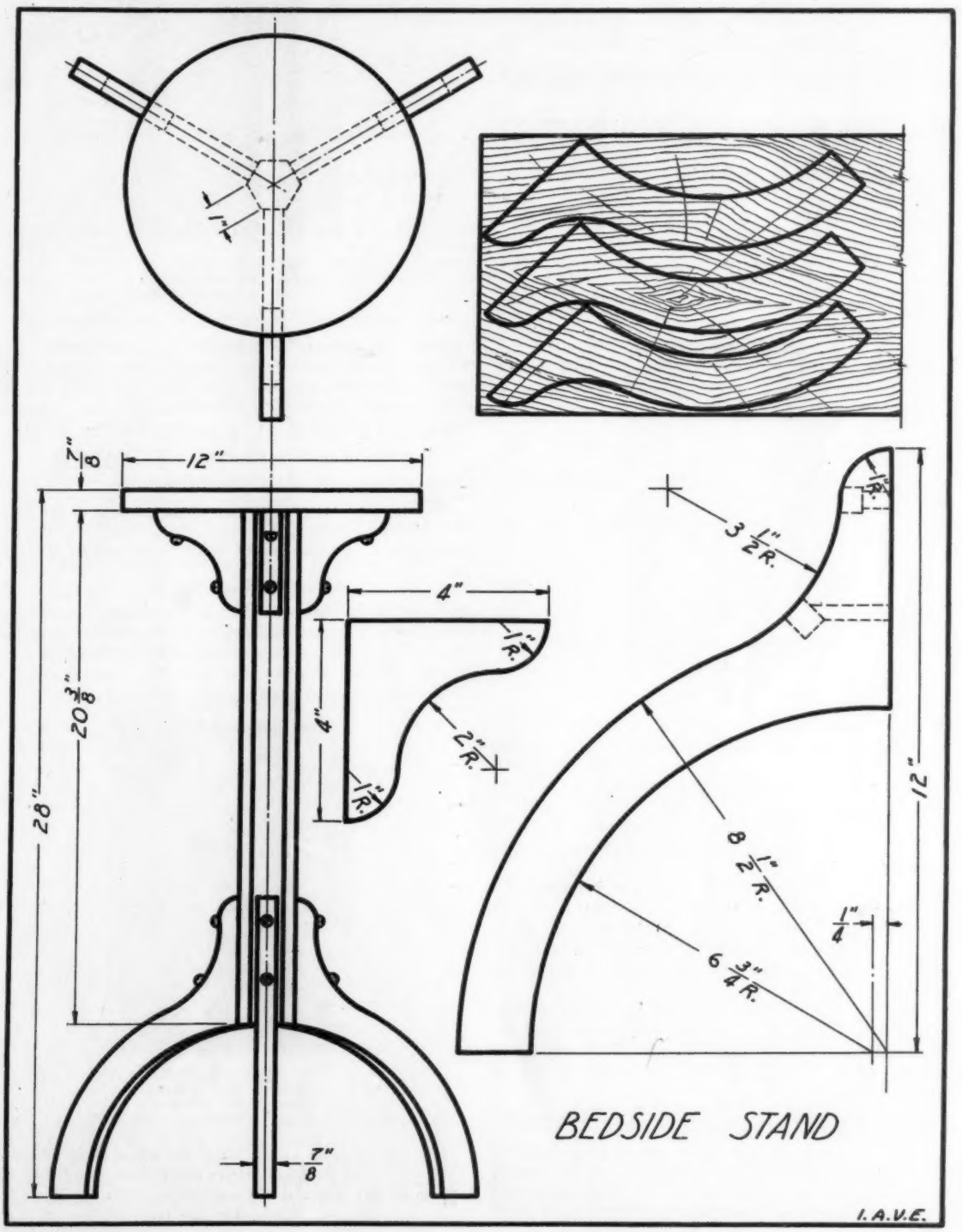
As a project it is equally versatile. In the form shown it has been made entirely by hand by eighth-grade students. With a turned standard, a turned, molded, or inlaid top, and a more ornamental style of foot, it offers a project for the advanced worker.

The top of the stand may be either round, hexagon, square, or octagon. If square or octagon the standard should be square, with chamfered corners and four feet used instead of three. A slightly larger top may be used without increasing the size of the base, especially if four feet are used.

The drawings show the construction so clearly that much description is unnecessary. A cardboard or thin wood pattern is cut for the feet, also for the brackets under the top. Both these patterns are laid on the ma-

terial, as shown in the drawing, for strength and economy of material. The brackets are fastened with roundhead screws, the feet with screws in counterbored holes as shown, the holes afterward being filled with rounded plugs. Notice that for the lower screw in the feet, the counterboring is done perpendicular to the surface of the curve and the hole for the screw is then bored at right angles with the back of the foot. This is important, as it is almost impossible to draw the foot up tight if this hole runs at a slant.

We have used four other methods of fastening the feet; namely, mortise and tenon, dowel, slot screwing, and dovetailing. In slot screwing, the screws are run into the standard and left projecting about five eighths of an inch. Slots are then cut in the back of the feet and holes bored to receive the head of the screws. These holes and slots are so placed that when the feet are applied they are about half an inch too low. Glue is applied, the feet held firmly against the standard and driven along until they are flush with the bottom of it. For the dovetailing, a dovetail pin is cut on the back of the feet and a dovetail groove is cut in the standard. Glue is applied and the feet driven in from the bottom. The trouble with this method is, that after three dovetail grooves



are cut in this small standard (2 by 2¼ in.) the remaining material is rather weak and if the dovetail fits the least bit too tight the standard is split.

All things considered, the method just described is the best for boy craftsmanship. The work is put together dry, then taken apart, glued, and put together again.

The plugs or buttons are made by rounding up a strip about 10 in. long, rounding the end over and cutting off to the proper length. For the advanced student, the buttons are made in the lathe and are turned with a shoulder which covers the edge of the hole.

Personal News

MR. ROBERTS OF CLEVELAND RETIRES

Mr. William E. Roberts, who has been supervisor of manual arts at Cleveland, Ohio, for the past 40 years, is retiring this year to enjoy a well-earned rest.

Mr. Roberts was born at Cambridge, Mass., in July, 1866. He received his common-school education in that city, and spent seven years as a draftsman. Leaving the drafting board, he entered Massachusetts Institute of Technology in order to improve his education. Later he was chosen to teach drawing

MR. WILLIAM E. ROBERTS

at that institution. He also took educational work at Bradley Polytechnic Institute, Harvard University, Columbia University, and the Rhode Island School of Design. From 1890–93 he was principal of the West Manual Training School at Cleveland. In 1893 he assumed his duties as supervisor of manual arts at Cleveland, Ohio, and continued in this position until he retired.

Many teachers and executives in the field of industrial education will remember him as a teacher at summer sessions at Teachers College, Columbia University; University of Illinois; University of Chicago; Bradley Polytechnic Institute; University of Washington; the Cleveland School of Education; and the Western Reserve University.

He has been active in numerous educational associations, holding offices of trust and responsibility in most of them. He is also well known as the author of several bulletins and books, and as the writer of many editorials and articles for professional periodicals.

DR. L. H. DENNIS GOES TO MICHIGAN

Dr. L. H. Dennis, formerly deputy state superintendent of schools in Pennsylvania, goes to Lansing, Mich., as assistant state superintendent of schools. In his new position, Dr. Dennis will have charge of all secondary education in the state, in addition to the supervision of teacher training and vocational education.

He was born in Dover, N. H., was educated in the Brewster Academy at Wolfboro, in the Friends School at Westtown, Pa., and the State Normal School at Bloomsburg, Pa. He is a graduate of the Pennsylvania State College, attended Bucknell

DR. L. H. DENNIS
Assistant State Superintendent of Schools, Lansing, Michigan

University, and Cornell University, and holds degrees from the Pennsylvania State College and Columbia University. He has filled numerous positions in the educational field and has held important positions in a number of educational organizations.

THOMAS G. BROWN BECOMES PRINCIPAL

Mr. Thomas G. Brown was appointed principal of the Boys' Technical High School, Milwaukee, Wis., to succeed the late James L. Cox. Mr. Brown had previously served as vice-principal.

He received his early education in East Tennessee, was graduated from Maryville College, and later completed his education at Stanford University, California. He taught at Maryville College; the Minneapolis Central High School; at Calumet, Mich., where he also served as principal; and at Bridgton Academy in Maine.

MR. THOMAS G. BROWN
Principal, Boys' Technical High School, Milwaukee, Wisconsin

Mr. Brown came to the Boys' Technical High School in 1919 as head of the mathematics department. In 1924 he was appointed vice-principal of the school.

(Continued on page 7a)

Are the STUDENTS in *your* SHOP COURSES *really* GETTING an EDUCATION?

A national leader of public opinion has just said:

"Education is in books and thinking. The books without thought are worthless, thought without knowledge that books contain is nearly worthless."

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Every wide-awake educator has developed a consciousness of "per-pupil" costs. Many teachers are reporting larger shop classes this fall. They will reduce "shop-per-pupil" costs and do a better teaching job by putting a larger part of their instruction load on good teaching tools, BOOKS.

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The most complete book on model aircraft ever written. Contains instructions for 65 models including gliders, stick models, solid scale models, built-up non-flying scale models and flying scale models. The plans and diagrams are marvels of clearness and accuracy, from the simple gliders that any small boy can make to the elaborate flying models. Such types as the Pitcairn cabin autogiro, the flying army blimp, the Northrop Gamma "Sky Chief," and many others, have never before appeared in any book.

The introductory chapters are a complete encyclopedia of model airplane construction with full illustrations. Tools and materials are explained.

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77 photographs *120 insignia*
500 illustrations *Aviation dictionary*

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DETAILED, ILLUSTRATED CIRCULAR ON REQUEST

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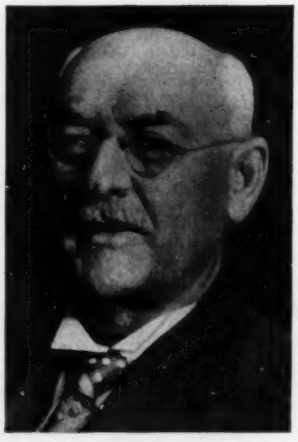
(Continued from page 362)

JAMES L. COX

Late Principal, Boys' Technical High School, Milwaukee, Wisconsin

James L. Cox, late principal of the Boys' Technical High School, Milwaukee, Wis., died at his home on September 26, after a long illness. He was 69.



JAMES L. COX

Mr. Cox had been associated with the Boys' Technical High School for 26 years, having entered the school as a member of the faculty. Before becoming associated with the school, Mr. Cox had been employed as a draftsman for the Allis Chalmers Company and had taught night classes at the Y.M.C.A. When the Milwaukee School of Trades was opened, he was asked to take charge of the mechanical-drafting department and to teach mathematics. He became principal in 1910.

Born in Morris, N. Y., in 1864, Mr. Cox received his common-school education in Norwich, and later attended Cornell University.

Mr. Cox is survived by his wife, two sons, two daughters, and a sister.

F. W. ZIEGENHAGEN BECOMES VICE-PRINCIPAL

Mr. Frederick W. Ziegenhagen was appointed vice-principal of the Boys' Technical High School, Milwaukee, Wis. He has been a teacher of this institution since 1914, during which time he served as an instructor in the woodworking department, and as head of the high-school department.

MR. FRED W. ZIEGENHAGEN
Assistant Principal Boys' Technical High School, Milwaukee Wisconsin

(Continued on page 8a)

RECENT McGRAW-HILL TEXTS

PROBLEMS IN MACHINE DRAWING

By R. B. FELTEN, late Instructor of Mechanical and Machine Drawing, South Bend Central Senior High School, South Bend, Ind. 186 pages, 10x8, illustrated. $1.90

A practical, up-to-date text for advanced mechanical drawing classes. It presents thoroughly tested problems pertaining to machine fastenings, mechanisms of power and motion, motors and machines. All problems are closely correlated with industrial applications.

AN INTRODUCTION TO ARCHITECTURAL DRAWING

By W. B. FIELD, Associate Professor of Engineering Drawing, Ohio State University. 103 pages, 9½x12½, illustrated. $2.50

A stimulating introductory text for the beginning student in architecture and architectural drafting. Explains the graphic methods of representing the elements of a simple building—the house—including floor plans, elevations, vertical sections, and large scale plans.

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(Continued from page 7a)

Mr. Ziegenhagen holds a bachelor of science degree from the University of Wisconsin where he has also practically completed his graduate work for a masters' degree.

Some Questions Answered

MATCHING ANTIQUE MAHOGANY

971. Q.: I have just finished a reproduction of an old antique slant-front desk. It is made of the so-called Philippine mahogany. Will you tell me how to finish this desk so it will match an old antique lowboy (real mahogany). I have tried several stains including Dakolite water stain without the desired result. Also the paste filler will not fill the grain level as desired. — *S.A.R.*

A.: You have asked me a very difficult question indeed when you ask me to match a color which I cannot see, or of which no samples are available. The so-called Philippine mahogany varies from almost white to a very dark brown with many shades of bright red in between. In my book *Principles of Mill and Paint Shop Practice*, published by The Bruce Publishing Company, the frontispiece, a piece of stained Philippine mahogany, is shown in color. The natural color of this wood is shown on page 86. The frontispiece color formula is given on page 236, being based on a 4-oz. solution. With this as a start you can vary the amounts of orange and red to get the shade you have in the original lowboy. In work of this kind, it will be generally necessary for the beginner to do considerable color trial matching. Do not judge the finished color until the panel has been shellacked, filled, and reshellacked over the stain.

The matter of the filler not leveling off is typical of the deep, open-pored grain of Philippine mahogany. It is necessary to double fill, with an interval of 24 hours between coatings, or to use from 14 to 18 lb. of filler base per gallon of thinner. Such filler should be given at least 48 hours drying in a warm room to secure thorough bottom drying. It is necessary that the filler be brushed on "with the grain" and rubbed off across the grain. It is vital also that the filler be well padded in by working in a circular motion with a cloth pad, while still in the liquid state. To neglect any of these items is to get indifferent results. — *Ralph G. Waring.*

Associations, Conventions

AMERICAN VOCATIONAL ASSOCIATION AT DETROIT

The American Vocational Association, which will hold its annual meeting December 6 to 9, at Detroit, Mich., will take for its theme "Vocational Education for Relief and Reconstruction." The headquarters for the meeting will be located in the Hotel Statler.

Approximately 2,500 members of the association are expected to be present at the meeting. The central location of Detroit makes it possible for a large number from all parts of the United States to attend.

Visitors to the city will be able to obtain a good idea of the Michigan program of vocational education, with Detroit, Pontiac, Saginaw, Flint, Grand Rapids, and Muskegon as centers for important vocational and technical schools. Detroit has six vocational and technical schools as part of its program for public-school education. The University of Michigan at Ann Arbor, the Ypsilanti Teachers' College, and the Michigan State College at East Lansing all participate in the program for training teachers of vocational education.

Plans are going forward for the preparation of the program,

(Continued on page 9a)

(Continued from page 8a)

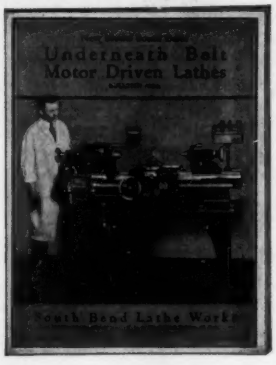
which is under the direction of Mr. Ray Fife, president, assisted by a large group representing the various divisions of the work.

Information concerning the program and speakers may be obtained from Mr. Warren E. Bow, assistant superintendent of schools at Detroit, and chairman of local arrangements for the meeting.

SchoolShopEquipmentNews

NEW SOUTH BEND LATHE BOOKLET

The South Bend Lathe Works, South Bend, Ind., has just issued a new catalog No. 101-A, illustrating and describing its underneath belt, motor-driven lathes.



The booklet describes the mechanical features of this type of back-geared, screw-cutting precision lathes, and illustrates the various sizes available for machine-shop work, repair-shop work, automotive service, etc. It also includes a wide range of underneath-drive toolroom lathes, as well as countershaft-drive lathes in a variety of sizes. A section of the booklet is devoted to the various attachments, chucks, and tools, with which the lathes may be equipped.

A copy of the booklet will be sent to any shop instructor upon request.

VASCO ELECTRICAL SUPPLIES FOR SCHOOL PROJECTS

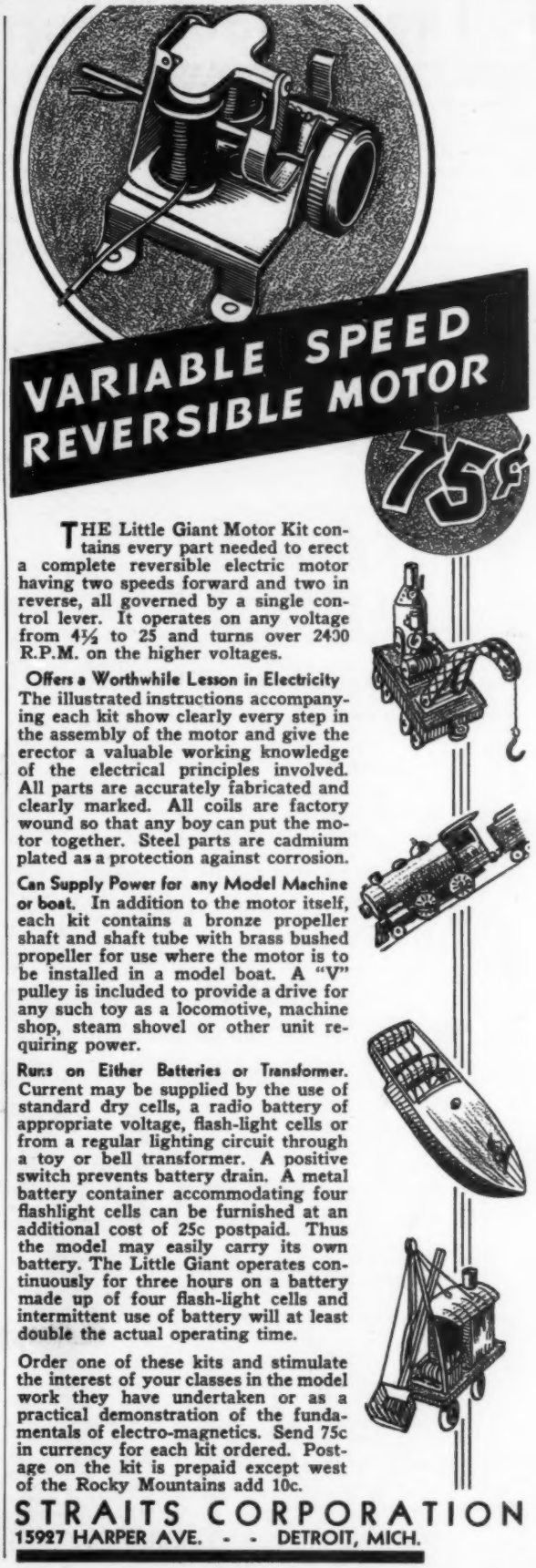
The Vocational Arts Supply Company, 939 West Twelfth St., Los Angeles, Calif., has issued an eight-page circular, describing and illustrating its line of electrical supplies for vocational and industrial-arts classes in junior high, senior high, trade, and vocational schools.

The circular lists such equipment as electric soldering-iron parts, threaded tubes, heater and lamp cord, electric-stove parts, resistance wire, motor parts, magnet castings, waffle-iron parts, toaster parts, heater plugs, radio-key parts, machine-screw taps, and steel tubing.

The firm endeavors to supply the highest-grade materials possible and seeks to coöperate with instructors in securing for them the best educational projects at the lowest cost. Vasco supplies are well known to instructors throughout the country who have found that they save time and money.

NEW LEATHERCRAFT CATALOG

Charles A. Toebe, 149 N. Third St., Philadelphia, Pa., has just issued a new catalog describing the equipment and materials needed for artistic leathercraft. The catalog offers a varied list of projects, books on leathercraft, useful materials for the leathercrafter, describes the various kinds of leathers, skins, tools, and other needed materials. The booklet also contains an outline of tooling instructions.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Order one of these kits and stimulate the interest of your classes in the model work they have undertaken or as a practical demonstration of the fundamentals of electro-magnetics. Send 75c in currency for each kit ordered. Postage on the kit is prepaid except west of the Rocky Mountains add 10c.
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The School Shop Shopping Guide

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2 qt. .	$17
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LETTERING

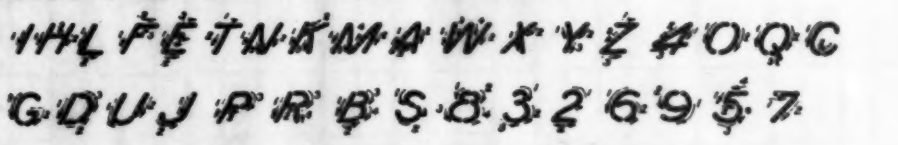
1. LETTERING WILL BE IN CAPITALS OF UNIFORM HEIGHT.
2. LETTERS WILL BE MADE AT A 60° SLANT.
3. MAIN TITLES WILL BE $\frac{3}{16}$ HIGH, SUBTITLES $\frac{1}{8}$, AND NOTES $\frac{3}{32}$.
4. BEGINNERS LEARNING THE SHAPE, SLANT, AND SPACING OF LETTERS WILL DRAW THEM BETWEEN LIGHT SLANT AND HORIZONTAL LINES.

ABCDEFGHIJKLMNOPQRSTUV
WXYZ & 1234567890 $\frac{1}{8}$ $\frac{3}{32}$ $\frac{5}{64}$

5. WIDTH OF LETTERS EQUALS $\frac{4}{5}$ OF HEIGHT. EXCEPTIONS ARE "I", "M", AND "W".
6. WIDTH OF SPACE FOR "I" EQUALS $\frac{1}{3}$ HEIGHT. "I" IS DRAWN IN MIDDLE OF THIS SPACE.

LAMINATED NOT LAMINATED SPACE FOR "M" AND "W" EQUALS HEIGHT.

7. SPACE BETWEEN LETTERS WILL BE APPROXIMATELY $\frac{1}{8}$ OF HEIGHT.
8. SPACE BETWEEN WORDS WILL EQUAL THE WIDTH OF ONE REGULAR LETTER.
9. SPACE BETWEEN SENTENCES WILL EQUAL THE WIDTH OF TWO LETTERS.
10. PUNCTUATION MARKS WILL BE SEPARATED FROM THE PRECEEDING WORD BY $\frac{1}{8}$ AND FROM THE FOLLOWING WORD BY $\frac{3}{8}$ THE HEIGHT OF ONE LETTER. AS, FOR EXAM
11. CERTAIN COMBINATIONS OF TRIANGULAR LETTERS AS AV, AY, LV, WA, ETC. WILL BE SPACED AS ILLUSTRATED. CORRECT: BOLTED INCORRECT: BOLTED.
12. LETTERS WILL NEVER BE PLACED ON ANY LINE OF THE DRAWING.
13. LETTERING WILL BE UNDERLINED FOR EMPHASIS ONLY.
14. NOTES WILL BE LETTERED HORIZONTALLY.
15. WHOLE NUMBERS WILL BE THE HEIGHT OF ACCOMPANYING LETTERS. NO. 5
16. IN DIMENSIONING, THE HEIGHT OF FIGURES WILL BE IN PROPORTION TO THE SIZE OF THE DRAWING BUT NEVER LESS THAN $\frac{3}{32}$ OF AN INCH HIGH.
17. COMMON FRACTIONS WILL BE $\frac{5}{8}$ THE HEIGHT OF ACCOMPANYING WHOLE NUMBERS.
18. NEITHER THE NUMERATOR NOR DENOMINATOR OF A COMMON FRACTION WILL TOUCH THE BAR SEPARATING THEM. $\frac{1}{2}$ NOT $\frac{1}{2}$
19. ALL GUIDE LINES, EXCEPT THE TWO AT TOP AND BOTTOM, MAY BE OMITTED AFTER CORRECT SHAPE OF LETTERS AND FIGURES HAS BEEN LEARNED.
20. TWO LIGHT PENCIL GUIDE LINES WILL BE DRAWN ON THE TRACING PAPER BEFORE BEGINNING TO TRACE. DO NOT RELY ON GUIDE LINES ON DRAWING BENEATH.
21. RECOMMENDED ORDER & DIRECTION OF STROKES:



MACHINE DRAFTING DIVISION, VOCATIONAL DEPARTMENT, J. STERLING MORTON HIGH SCHOOL, CICERO, ILLINOIS

TRACING SUPPLEMENT, No. 277, November, 1933
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

Described Elsewhere in This Issue

Arranged and contributed by H. D. Campbell, Cicero, Ill.

TRACING SUPPLEMENT, No. 278, November, 1933
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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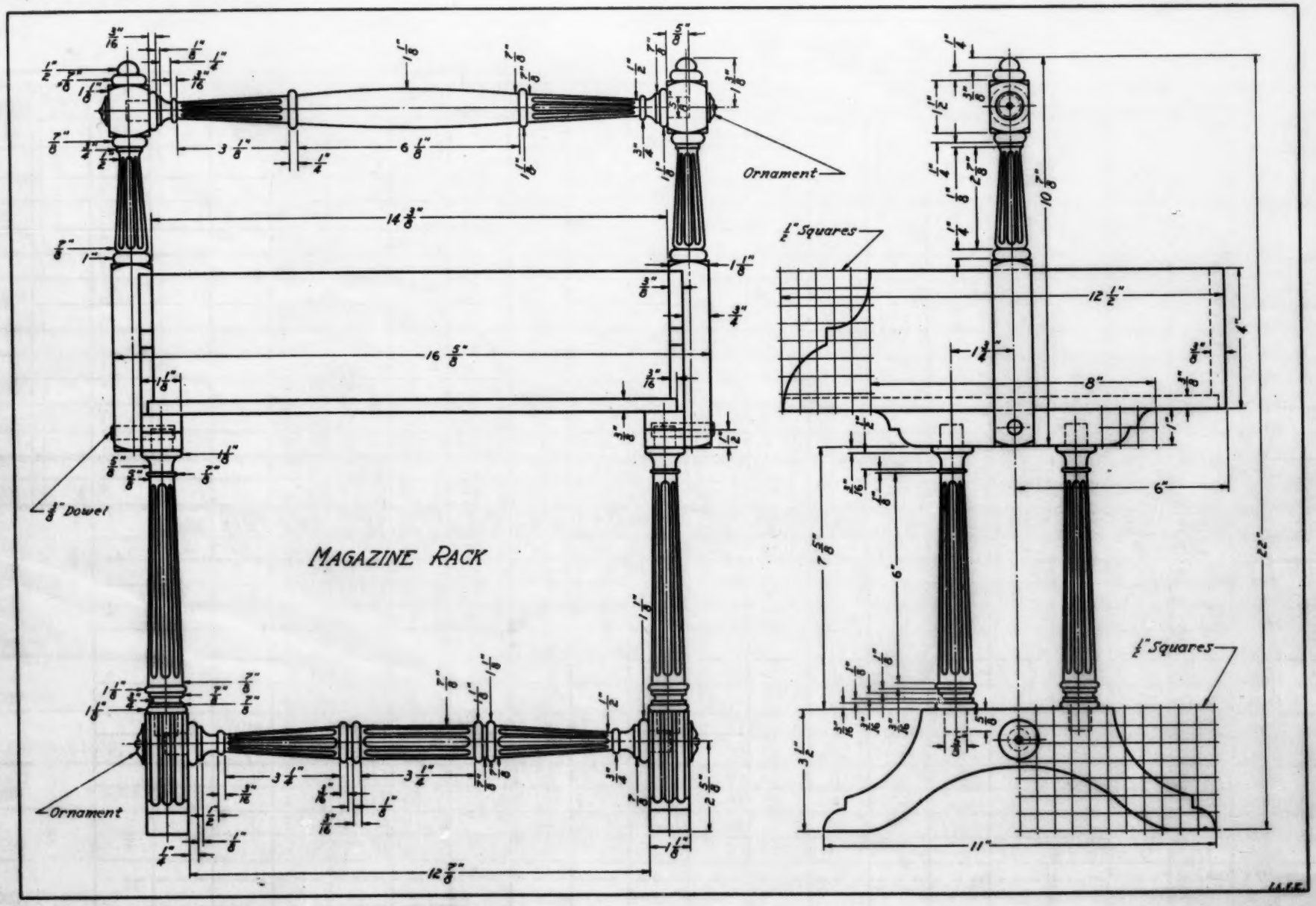

Designed by W. Ben Hunt, Hales Corners, Wis.

Described Elsewhere in This Issue

The Safety Lathe that . . . . Modern Instruction Demands

STUDENTS like to feel that they are learning a trade with machines such as they will use in actual work after they leave school, and instructors too are equally interested in using such tools in their class work. Furthermore they demand machines that are easy to adjust and operate and offer as much protection to the students as it is compatible with the work they do.

In the new T-12 SPEED LATHE we have combined skillful design and accurate workmanship,—essential requisites of the machinery intended for industrial plants,—and the simplicity of adjustment, the ease of operation and the safety features demanded by progressive instructors of our vocational and manual training schools.

Safety Features

1. *Motor cannot be accidentally started by moving the speed control lever.*
2. *Motor will start only when control lever is at lowest speed position and start button is pushed.*
3. *Top of push button is slightly below surface to prevent accidental starting.*
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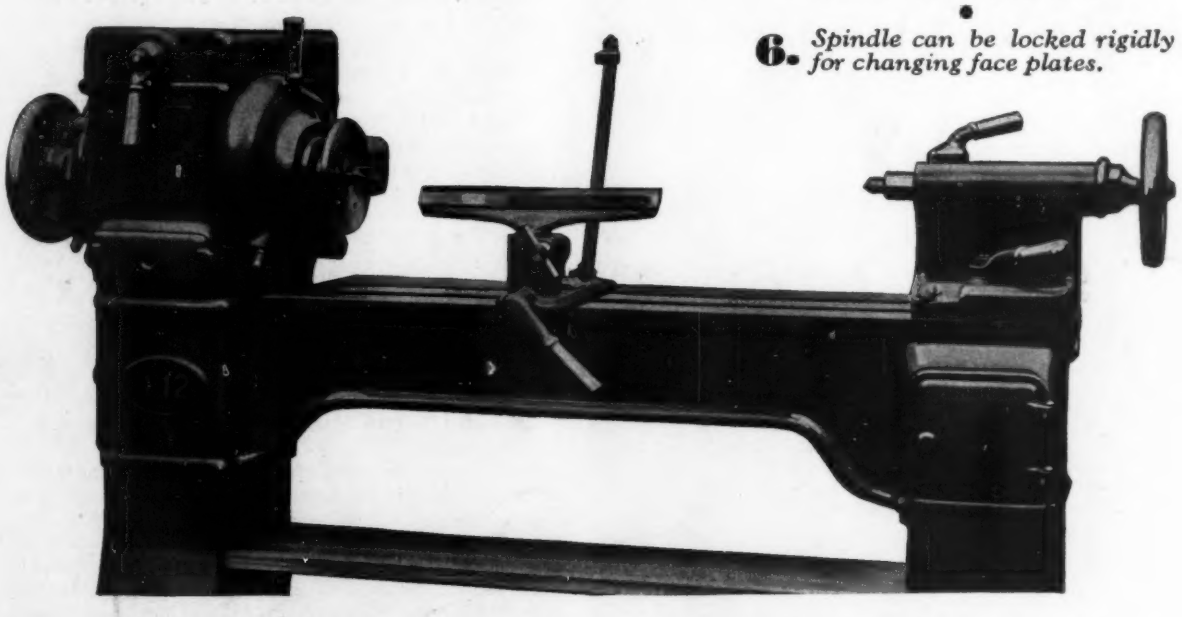

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STENCILED DESIGNS

972. Q.: About 100 years ago there were manufactured in this country quite a variety of chairs of the type known as the Boston Rocker, that had on the top of the backs patterns that apparently were worked out in gold leaf. Some of these gold-leaf patterns had in them shadings of brown and green. Can you tell me through your Questions and Answers Department the exact method of producing these designs and of restoring them? — *K.R.H.*

A.: The stencil designs used on the old Boston rockers and Hitchcock chairs are exceedingly hard for the beginner to duplicate. The first thing is to decide upon a design suited to the space available on the chair. Then the design must be transferred onto a rather heavy-bodied paper, after which the design is perforated with a tracing wheel, so that when the paper is attached to the work with stickers, it may be pounced with a piece of cheesecloth containing a tablespoonful of lamp black. The sheet is then carefully removed to avoid smearing the dusted-on design and the background brushed in solid, generally in gold bronze, not leaf. When dry, the design is again pounced on and the next colored portion brushed in. It is here that the training and artistry of the designer appears since the variance in both brush strokes and the materials will appreciably modify the result, especially where the brush strokes are shaded. Again, some of the designs are stippled on with an almost dry, blending, badger brush to give the faint but easily discernible features of the design. In any case, where it is attempted to reproduce a given design, that design must be before the reproducer at all times. For the beginner, several trials as to materials and methods are in order. — *Ralph G. Waring.*

CHROMIUM AS A RUST PREVENTIVE

973. Q.: I am told that wrought iron treated with a chromium-salt bath is the best-known rust preventive. Can you give definite instructions for its use? — *G.F.V.*

A.: You have been misinformed. A solution of chromic acid is a most excellent cleaning or pickling acid for iron, but its value as a rust preventive is nil. In order to be effective, the process must be carried to a point where the metal chromium must be deposited electrolytically from a properly compounded plating bath by means of a correctly metered direct current. There is a world of difference between pickling and plating. Chromium plating is a matter of careful trade practice, and is far more tricky than nickel or silver plating. — *Ralph G. Waring.*

STAINING INLAID SURFACES

974. Q.: What preparation is necessary before applying water stain to a surface having line or panel inlays? — *A.X.D.*

A.: In the Pullman shops where inlay and intarsia are production problems, it is the customary practice to size this material with white shellac reduced to a pound and a half cut with alcohol. This is generally applied with a saber brush or a red-sable pencil. Great care must be exercised to avoid getting the shellac on the background surrounding the inlay. If any does get on, it must be sanded off with a split 8/0 garnet finishing paper. This operation requires particular skill to prevent sanding holes or grooves in the wood, which would subsequently show up badly when covered with the final finish.

After the shellac has dried, the entire work may then be filled and stained as needed.

Over the stained and filled work, a fine varnish finish is applied, sanded, the last coat being rubbed to produce a fine level surface with a semipolished effect. — *Ralph G. Waring.*

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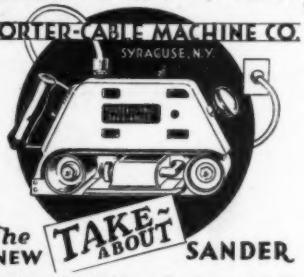

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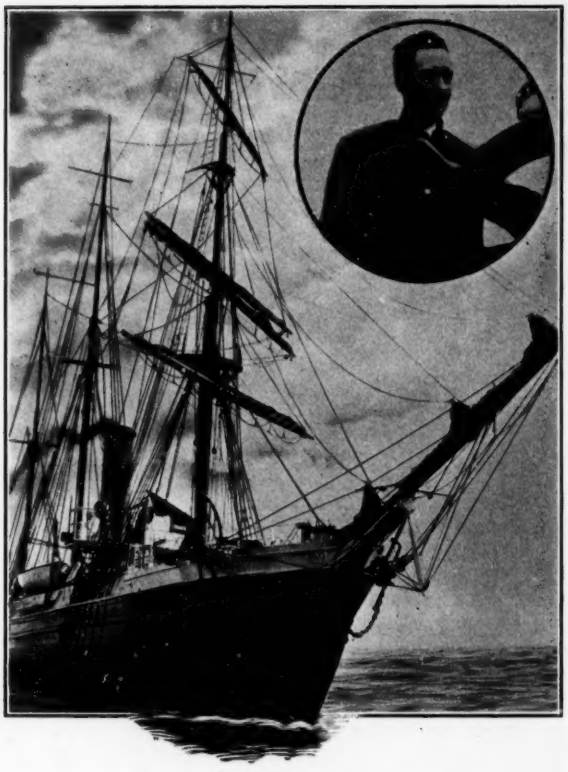

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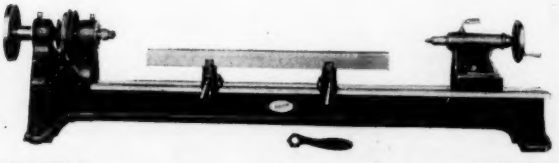

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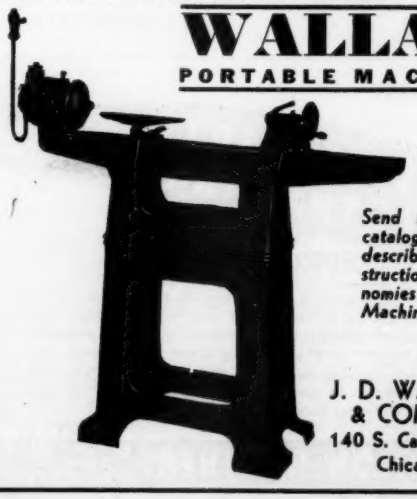

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